

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: MARK RUTHKOSKY Examiner #: 26046 Date: 8/29/00
 Art Unit: 1745 Phone Number 303-5-0587 Serial Number: PET 45 00/11006
 Mail Box and Bldg/Room Location: 4A01 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: PROTON CONDUCTING POLYMER MEMBRANES

Inventors (please provide full names): ALLCOCK, HARRY ; HOFMANN, MICHAEL

LYOV, SERGEI ; ZHOU, XIANG

Earliest Priority Filing Date: JUNE 11, 1999

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

- THE CLAIMS ARE VERY BROAD MAKING THE SEARCH DIFFICULT. I INCLUDED A COPY IF YOU HAVE ANY GOOD IDEAS FOR A SEARCH.
- KEY WORDS MAY INCLUDE: polyphosphazene, polytetrafluoroethylene or PTFE, (sulfuric acid, nitric acid, and phosphoric acid would be the most common acids), casting, evaporating, phosphorous oxychloride and maybe oxyacid (which is not a common abbreviation).
- The casting step may be the simplest limitation in the process.
- Thank you!

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Type of Search		Vendors and cost where applicable
Searcher: <u>EST</u>	NA Sequence (#) _____	STN <u>\$364.84</u>
Searcher Phone #: _____	AA Sequence (#) _____	Dialog _____
Searcher Location: <u>STIC</u>	Structure (#) _____	Questel/Orbit _____
Date Searcher Picked Up: _____	Bibliographic <input checked="" type="checkbox"/> _____	Dr.Link _____
Date Completed: <u>8-31-00</u>	Litigation _____	Lexis/Nexis _____
Searcher Prep & Review Time: <u>10</u>	Fulltext _____	Sequence Systems _____
Clerical Prep Time: _____	Patent Family _____	WWW/Internet _____
Online Time: <u>110</u>	Other _____	Other (specify) _____

We claim:

1. A method for making a proton conducting polymeric membrane comprising
 - dissolving a polymer in an organic solvent to form a polymer solution;
 - adding an oxyacid to the polymer solution;
 - casting the oxyacid-containing polymer solution onto a casting surface; and
 - removing the organic solvent so as to form a proton conducting polymeric membrane.
2. The method of claim 1 further comprising adding water to the oxyacid-containing polymer solution in a molar ratio equivalent to the oxyacid.
3. The method of claim 1 further comprising concentrating the oxyacid-containing polymer solution prior to casting the oxyacid-containing polymer solution onto the casting surface.
4. The method of claim 1 wherein the polymer is selected from polyphosphazenes, polyalkenes, polyacrylics, polyvinyl ethers, polyvinylhalides, polystyrenes, polyesters, polyurethanes, and polyamides.
5. The method of claim 4 wherein the polymer is a polyphosphazene.
6. The method of claim 1 wherein the organic solvent is tetrahydrofuran.
7. The method of claim 1 wherein the oxyacid is selected from boric, carbonic, cyanic, isocyanic, silicic, nitric, nitrous, phosphoric, phosphorous, hypophosphorous, arsenic, arsenious, antimonie, sulfuric, sulfurous, selenic, selenious, telluric, chromic, dichromic, perchloric, chloric, chlorous, hypochlorous, bromic, bromous, hypobromous, periodic, iodic, hypiodous, permanganic, manganic, pertechnetic, technetic, perrhennic, rehnnc acids, and their condensation products.
8. The method of claim 1 wherein the oxyacid is phosphorous oxychloride.

9. The method of claim 1 wherein the casting surface is formed of or coated with polytetrafluoroethylene.

10. The method of claim 1 wherein the organic solvent is removed by evaporation.

11. A proton conducting polymeric membrane comprising a mixture of a polyphosphazene and an oxyacid.

12. A proton conducting polymeric membrane made by any of the methods of claims 1-11.

13. A fuel cell comprising the proton conducting polymeric membrane of any of claims 1-12.

PROTON CONDUCTING POLYMER MEMBRANES

Abstract of the Disclosure

Proton conducting membranes having improved resistance to methanol crossover are provided, along with methods for their manufacture. In a preferred embodiment, the polymeric membranes are formed by (a) dissolving a polymer, preferably a polyphosphazene, in an organic solvent to form a polymer solution; (b) adding an oxyacid to the polymer solution; (c) optionally, adding water to the polymer solution, preferably in a molar ratio equivalent to the oxyacid; (d) optionally, concentrating the polymer solution; (e) casting the polymer solution on a casting surface, such as one formed of or coated with TEFLON™; and (f) removing the organic solvent, so as to form the polymeric membrane. A particularly useful application for these polymeric membranes is in fuel cells, such as those wherein methanol and oxygen are converted into electrical energy.

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(FILE 'HOME' ENTERED AT 09:15:50 ON 31 AUG 2000)

FILE 'REGISTRY' ENTERED AT 09:17:38 ON 31 AUG 2000
E POLYPHOSPHAZENE/CN
E PHOSPHAZENE/CN

L1 1 SEA "PHOSPHAZENE TETRAMER"/CN

FILE 'HCA' ENTERED AT 09:18:56 ON 31 AUG 2000

L2 1799 SEA POLYPHOSPHAZENE#
L3 1107 SEA POLYPHOSPHAZENE#/IT

FILE 'REGISTRY' ENTERED AT 09:22:04 ON 31 AUG 2000

L4 423 SEA ?PHOSPHAZEN?/CNS
L5 145 SEA L4 AND PMS/CI

FILE 'HCA' ENTERED AT 09:36:59 ON 31 AUG 2000

L6 3320 SEA L5 OR POLYPHOSPHAZEN? OR (PHOSPHAZEN? OR PHOSPHONITRI
L!AMID? OR PHOSPHONITRIL##(A)AMID##) (3A) (POLY OR POLYM#
OR POLYMER? OR COPOLYM# OR COPOLYMER? OR TERPOLYM# OR
TERPOLYMER? OR RESIN?)

FILE 'REGISTRY' ENTERED AT 09:37:15 ON 31 AUG 2000

L7 E BORIC ACID/CN
2 SEA "BORIC ACID"/CN
L8 E CARBONIC ACID/CN
1 SEA "CARBONIC ACID"/CN
L9 E CYANIC ACID/CN
1 SEA "CYANIC ACID"/CN
L10 E ISOCYANIC ACID/CN
1 SEA "ISOCYANIC ACID"/CN
L11 E SILICIC ACID/CN
2 SEA "SILICIC ACID"/CN
L12 E NITRIC ACID/CN
1 SEA "NITRIC ACID"/CN
L13 E NITROUS ACID/CN
1 SEA "NITROUS ACID"/CN
L14 E PHOSPHORIC ACID/CN
1 SEA "PHOSPHORIC ACID"/CN
L15 E PHOSPHOROUS ACID/CN
2 SEA "PHOSPHOROUS ACID"/CN
L16 E HYPOPHOSPHOROUS ACID/CN
2 SEA "HYPOPHOSPHOROUS ACID"/CN

L17 E ARSENIC ACID/CN
1 SEA "ARSENIC ACID"/CN
E ARSENIOUS ACID/CN
L18 1 SEA "ARSENIOUS ACID (H3ASO3)"/CN
E ANTIMONIC ACID/CN
L19 1 SEA "ANTIMONIC ACID"/CN
E SULFURIC ACID/CN
L20 1 SEA "SULFURIC ACID"/CN
E SULFUROUS ACID/CN
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L25 1 SEA "CHROMIC ACID"/CN
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E BROMIC ACID/CN
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E BROMOUS ACID/CN
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E HYPOIDOUS ACID/CN
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E PERMANGANIC ACID/CN
L37 1 SEA "PERMANGANIC ACID"/CN
E MANGANIC ACID/CN
L38 1 SEA "MANGANIC ACID (H2MN7O24)"/CN
E PERTECHNETIC ACID/CN
L39 1 SEA "PERTECHNETIC ACID"/CN
E TECHNETIC ACID/CN
L40 0 SEA "TECHNETIC ACID"/CN
L41 1 SEA "TECHNETIC ACID (H2TCO4)"/CN
E PERRHENNIC ACID/CN
E PERRHENIC ACID/CN
L42 1 SEA "PERRHENIC ACID"/CN

E REHNNIC ACID/CN
E REHN\NIC ACID/CN
E REHNIC ACID/CN

L43 35 SEA L7 OR L8 OR L9 OR L10 OR L11 OR L13 OR L15 OR L16 OR
L17 OR L18 OR L19 OR (L21 OR L22 OR L23 OR L24 OR L25 OR
L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR L32 OR L33 OR
L34 OR L35 OR L36 OR L37 OR L38 OR L39 OR L40 OR L41 OR
L42)

L44 3 SEA L12 OR L14 OR L20

FILE 'HCA' ENTERED AT 09:58:03 ON 31 AUG 2000

L45 53387 SEA L43

L46 296648 SEA L44 OR HNO3 OR H3PO4 OR H2SO4

L47 788 SEA OXYACID#

L48 45709 SEA FUELCELL? OR (FUEL? OR HYDROGEN# OR H2 OR H) (2A) (CELL
OR CELLS)

L49 1950 SEA ((PROTON? OR HYDROGEN# OR H) (2A) (COND# OR CONDUCT?
OR TRANSFER? OR DIFFUS? OR SUFFUS? OR EFFUS? OR INFUS?)) (2A) MEMBRAN?

L50 375186 SEA CAST OR CASTS OR CASTED OR CASTING# OR MOULD? OR
MOLD?

FILE 'REGISTRY' ENTERED AT 10:03:57 ON 31 AUG 2000

E PHOSPHORUS OXYCHLORIDE/CN

L51 1 SEA "PHOSPHORUS OXYCHLORIDE"/CN

FILE 'HCA' ENTERED AT 10:05:24 ON 31 AUG 2000

L52 5882 SEA L51 OR PHOSPHORUS# (2A) OXYCHLORIDE# OR POCL OR PO2CL

L53 1 SEA L49 AND L52

L54 98 SEA L49 AND L46

L55 4 SEA L54 AND L50

L56 1 SEA L49 AND L6

L57 106 SEA L49 AND (L45 OR L46 OR L47)

L58 4 SEA L57 AND L50

L59 7 SEA L48 AND L52

L60 10 SEA L48 AND L6

L61 2468 SEA L48 AND (L45 OR L46 OR L47)

L62 71 SEA L61 AND L50

L63 0 SEA L62 AND L47

L64 5 SEA L62 AND L45

L65 533443 SEA MEMBRAN?

L66 10 SEA L62 AND L65

L67 181 SEA L6 AND L65

L68 0 SEA L67 AND L52

L69 35 SEA L67 AND L50

L70 0 SEA L69 AND (L45 OR L46 OR L47)

L71 1 SEA L67 AND (L45 OR L46 OR L47)

L72 5 SEA L69 AND ACID?

L73 77563 SEA (PROTON? OR HYDROGEN# OR H) (2A) (COND# OR CONDUCT? OR
TRANSPORT? OR TRANSFER? OR DIFFUS? OR SUFFUS? OR INFUS?
OR EFFUS? OR TRANSFUS?)

L74 9045 SEA L73 AND L65

L75 2 SEA L74 AND L6
L76 47 SEA L74 AND L50
L77 0 SEA L76 AND L52
L78 5 SEA L76 AND (L45 OR L46 OR L47)
L79 21 SEA L76 AND ACID?
L80 12 SEA L76 AND L48

FILE 'REGISTRY' ENTERED AT 11:03:08 ON 31 AUG 2000
E TEFLON/CN

L81 1 SEA TEFLON/CN

FILE 'HCA' ENTERED AT 11:03:44 ON 31 AUG 2000

L82 43578 SEA L81 OR TEFLON# OR POLYTETRAFLUOROETHYLENE# OR PTFE
L83 1 SEA L76 AND L82
L84 5 SEA L67 AND L82
L85 7 SEA L54 AND L82
L86 7 SEA L57 AND L82
L87 21 SEA L62 AND L82
L88 38 SEA L53 OR L55 OR L56 OR L58 OR L59 OR L64 OR L71 OR L72
OR L75 OR L83 OR L84 OR L85 OR L86
L89 24 SEA (L60 OR L66 OR L80) NOT L88
L90 34 SEA (L79 OR L87) NOT (L88 OR L89)
L91 26 SEA L88 AND L65
L92 17 SEA L89 AND L65
L93 15 SEA L90 AND L65
L94 12 SEA L88 NOT L91
L95 7 SEA L89 NOT L92
L96 19 SEA L90 NOT L93

=> file hca

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FILE COVERS 1967 - 25 Aug 2000 VOL 133 ISS 9
FILE LAST UPDATED: 25 Aug 2000 (20000825/ED)

=> d l91 1-26 cbib abs hitstr hitind

L91 ANSWER 1 OF 26 HCA COPYRIGHT 2000 ACS

132:300101 Composite **membran** suitable for use in electrochemical devices. Murphy, Oliver J.; Cisar, Alan J. (Lynntech, Inc., USA). U.S. US 6059943 A 20000509, 15 pp. (English). CODEN: USXXAM. APPLICATION: US 1998-25680 19980218. PRIORITY: US 1997-PV54150 19970730.

AB The invention relates to novel inorg.-org. composite **membranes** esp. useful as ionically conducting **membranes** in electrochem. devices. The composites consist of a polymeric matrix, which may or may not be an ionic conductor in its unfilled form, filled with an inorg. material having a high affinity for water, capable of exchanging cations such as protons, and preferably with a high cation mobility, either on its surface or through its bulk.

IT **9002-84-0, Polytetrafluoroethylene**
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler suitable for use in electrochem. devices)

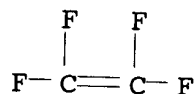
RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

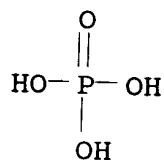
CMF C2 F4



IT **7664-38-2, Phosphoric acid, properties**
(interaction with zirconium nitrate with formation of zirconium phosphate used as ion exchanger in polymer composite **membrane**)

RN 7664-38-2 HCA

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C25B013-00

NCL 204296000

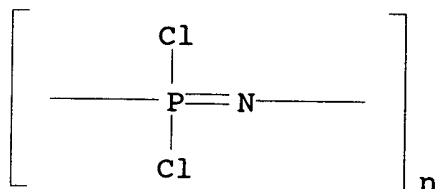
CC 72-3 (Electrochemistry)

Section cross-reference(s): 36

ST composite **membran** polymer inorg ion exchanger electrochem devices

- IT Fillers
(composite **membrane** consisting from polymeric matrix with inorg. filler suitable for use in electrochem. devices)
- IT Cation exchange **membranes**
Ion exchangers
Ionic conductors
Porous materials
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler suitable for use in electrochem. devices)
- IT Fluoropolymers, uses
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler suitable for use in electrochem. devices)
- IT **Membranes**, nonbiological
(composite; composite **membrane** suitable for use in electrochem. devices)
- IT Electric apparatus
(electrochem.; composite **membrane** suitable for use in electrochem. devices)
- IT Polymers, uses
(fluorinated; composite **membrane** consisting from polymeric matrix with inorg. filler suitable for use in electrochem. devices)
- IT Permeability
(gas permeability of composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler suitable for use in electrochem. devices)
- IT Oxides (inorganic), properties
(hydrated; ion exchanger inorg. filler in composite **membrane** consisting from polymeric matrix with)
- IT 9002-84-0, **Polytetrafluoroethylene**
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler suitable for use in electrochem. devices)
- IT 17341-24-1, Lithium 1+, properties
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler, Li⁺ conducting)
- IT 17341-25-2, Sodium 1+, properties
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler, Na⁺ conducting)
- IT 12586-59-3, Proton
(composite **membrane** consisting from polymeric matrix with ion exchanger inorg. filler, **proton conducting**)
- IT 9002-86-2, Polyvinyl chloride
(fluorinated; composite **membrane** consisting from polymeric matrix with inorg. filler suitable for use in electrochem. devices)
- IT 1314-23-4, Zirconia, properties 1314-35-8, Tungsten oxide, properties 11098-99-0, Molybdenum oxide 11113-84-1, Ruthenium oxide
13463-67-7, Titania, properties

- (hydrated; ion exchanger inorg. filler in composite
membran consisting from polymeric matrix with)
- IT 13746-89-9, Zirconium nitrate
(interaction with phosphoric acid with formation of zirconium
phosphate used as ion exchanger in polymer composite
membrane)
- IT 7664-38-2, Phosphoric acid, properties
(interaction with zirconium nitrate with formation of zirconium
phosphate used as ion exchanger in polymer composite
membrane)
- IT 13772-29-7, Zirconium phosphate
(ion exchanger inorg. filler in composite **membrane**
consisting from polymeric matrix with)
- L91 ANSWER 2 OF 26 HCA COPYRIGHT 2000 ACS
132:280105 **Polyphosphazene**-based cation-exchange
membranes: polymer manipulation and **membrane**
fabrication. Guo, Qunhui; Tang, Hao; Pintauro, Peter N.; O'Connor,
Sally (Department of Chemistry, Xavier University, New Orleans, LA,
70125, USA). ACS Symp. Ser., 744 (Membrane Formation and
Modification), 162-173 (English) 2000. CODEN: ACSMC8. ISSN:
0097-6156. Publisher: American Chemical Society.
- AB **Poly[bis(3-methylphenoxy)phosphazene]** was
sulfonated in soln. with SO_3 and soln.-cast into ion-exchange
membranes from N,N-dimethylacetamide. Water insol.
membranes were prep'd. with an ion-exchange capacity (IEC) as
high as 2.1 mmol/g. For water insol. polymers with an IEC < 1.92
mmol/g, there was no evidence of polymer degrdn. during sulfonation.
The glass transition temp. of the sulfonated polymer increased from
-28.degree.C (for the base polymer) to -10.degree.C for an IEC of
2.1 mmol/g. Equil. water swelling of a **phosphazene membrane**
with an IEC of 0.95 mmol/g was 24% greater than that of a DuPont
Nafion 117 cation-exchange **membrane**. The **proton**
cond. of a water-equilibrated 0.95 mmol/g IEC phosphazene
membrane in the H^+ form ranged from 0.012 S/cm at
25.degree.C to 0.058 S/cm at 60.degree.C. The water diffusion
coeff. in a 0.95 mmol/g IEC **membrane**, at satd. vapor
conditions, ranged from 8.0 .times. 10^{-8} cm²/s at 25.degree.C to 4.1
.times. 10^{-7} cm²/s at 60.degree.C.
- IT 26085-02-9DP, Poly(dichlorophosphazene), methylphenoxy
group-contg., sulfonated
(prepn. and properties of sulfonated poly
[bis(methylphenoxy)phosphazene] cation-exchange
membranes)
- RN 26085-02-9 HCA
CN Poly[nitrilo(dichlorophosphoranylidyne)] (8CI, 9CI) (CA INDEX NAME)



- CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 37
- ST sulfonated methylphenoxy **polyphosphazene** cation exchange membrane; glass temp sulfonated methylphenoxy **polyphosphazene** membrane; proton cond sulfonated methylphenoxy **polyphosphazene** membrane; water diffusion sulfonated methylphenoxy **polyphosphazene** membrane
- IT Cation exchange membranes
Glass transition temperature
Swelling, physical
(prepn. and properties of sulfonated poly [bis(methylphenoxy)**phosphazene**] cation-exchange membranes)
- IT **Polyphosphazenes**
(prepn. and properties of sulfonated poly [bis(methylphenoxy)**phosphazene**] cation-exchange membranes)
- IT Ionic conductivity
(proton; prepn. and properties of sulfonated poly[bis(methylphenoxy)**phosphazene**] cation-exchange membranes)
- IT Diffusion
(water; prepn. and properties of sulfonated poly [bis(methylphenoxy)**phosphazene**] cation-exchange membranes)
- IT 7732-18-5, Water, processes
(diffusion; prepn. and properties of sulfonated poly [bis(methylphenoxy)**phosphazene**] cation-exchange membranes)
- IT 26085-02-9DP, Poly(dichlorophosphazene), methylphenoxy group-contg., sulfonated
(prepn. and properties of sulfonated poly [bis(methylphenoxy)**phosphazene**] cation-exchange membranes)
- L91 ANSWER 3 OF 26 HCA COPYRIGHT 2000 ACS
131:353723 Method for activating fuel cell. Yasumoto, Eiichi; Gyoten, Hisaaki; Hatoh, Kazuhito; Nishida, Kazufumi; Kanbara, Teruhisa (Matsushita Electric Industrial Co., Ltd., Japan). Eur. Pat. Appl. EP 961334 A2 19991201, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 1999-109371

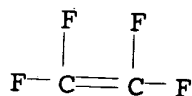
19990601. PRIORITY: JP 1998-150988 19980601; JP 1998-166637
19980615.

- AB A method of activating a polymer electrolyte fuel cell comprising .gtoreq.1 unit cell which is configured by including a **proton conductive** polymer electrolyte, an electrode layer having a catalytic activity arranged on the both faces of the polymer electrolyte **membrane** and a gas-supplying path is disclosed. The method comprises .gtoreq.1 of the step (a) of enhancing the catalytic activity of the electrode and the step (b) of giving a wetting condition to the polymer electrolyte. The catalytic activity of the electrode is enhanced by compulsively decreasing the output voltage of the cell in the step (a). A wetting condition to the polymer electrolyte is given by immersing and boiling the cell in a deionized water or weakly acidic aq. soln. and boiling in the step (b).
- IT 9002-84-0D, trifluoromethyl-terminated, sulfonated
(method for activating fuel cell)
- RN 9002-84-0 HCA
- CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

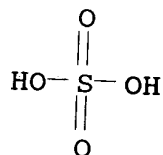
CM 1

CRN 116-14-3

CMF C2 F4



- IT 7664-93-9, Sulfuric acid, uses
(method for activating fuel cell)
- RN 7664-93-9 HCA
- CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



- IC ICM H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- IT 9002-84-0D, trifluoromethyl-terminated, sulfonated
(method for activating fuel cell)
- IT 7664-93-9, Sulfuric acid, uses
(method for activating fuel cell)

L91 ANSWER 4 OF 26 HCA COPYRIGHT 2000 ACS
 131:339483 **Membrane-electrode** unit for a fuel cell. Stimming,
 Ulrich (Firma Carl Freudenberg, Germany). PCT Int. Appl. WO 9960650
 A1 19991125, 19 pp. DESIGNATED STATES: W: AU, BR, CA, CN, JP, KR,
 MX, US, ZA; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT,
 LU, MC, NL, PT, SE. (German). CODEN: PIXXD2. APPLICATION: WO
 1999-EP2233 19990401. PRIORITY: DE 1998-19821978 19980518.

AB The invention relates to a **membrane** electrode unit for a
 fuel cell, comprising an optionally catalyst-coated anode, an
 optionally catalyst-coated cathode and a **proton**
conductor located between the anode and the cathode. The
 proton conductor consists of a microfiber-fleece material which has
 been impregnated with an electrolyte to the point of satn. The
 fleece material is chem. inert in relation to the electrolyte at
 temps. of up to +200.degree. and in oxidizing and reducing
 conditions and wts. 20 to 200 g/m2. The thickness of the fleece is
 less than 1 mm and the pore vol. is 65 to 92%.

IT **9002-84-0D, Ptfе, sulfonated perfluorovinyl ether**
 side chain

(**membrane-electrode** unit for fuel cell)

RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

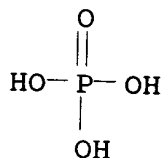
CMF C2 F4



IT **7664-38-2, Phosphoric acid, uses**
 (**membrane-electrode** unit for fuel cell)

RN 7664-38-2 HCA

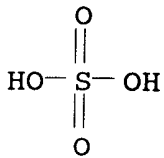
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IT **7664-93-9, Sulfuric acid, uses**
 (microfiber fleece impregnated with; **membran -electrode**
 unit for fuel cell)

RN 7664-93-9 HCA

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



- IC ICM H01M008-10
ICS H01M008-02
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- ST fuel cell **membrane** electrode unit
- IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, microfiber fleece coated with; **membrane**-electrode unit for fuel cell)
- IT Ionomers
(fluoropolymers; **membrane**-electrode unit for fuel cell)
- IT Fluoropolymers, uses
(ionomers; **membrane**-electrode unit for fuel cell)
- IT Fuel cells
(**membrane**-electrode unit for fuel cell)
- IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers, microfiber fleece coated with; **membrane**-electrode unit for fuel cell)
- IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., microfiber fleece coated with; **membrane**-electrode unit for fuel cell)
- IT Fluoropolymers, uses
(sulfonated perfluorovinyl ether side chain; **membrane**-electrode unit for fuel cell)
- IT 7783-28-0, Ammonium hydrogen phosphate 13765-95-2, Zirconium phosphate
(hydrated, microfiber fleece impregnated with; **membrane**-electrode unit for fuel cell)
- IT 9002-84-0D, Ptfе, sulfonated perfluorovinyl ether side chain
(**membrane**-electrode unit for fuel cell)
- IT 7664-38-2, Phosphoric acid, uses
(**membrane**-electrode unit for fuel cell)
- IT 7664-93-9, Sulfuric acid, uses
(microfiber fleece impregnated with; **membrane**-electrode unit for fuel cell)
- L91 ANSWER 5 OF 260 HCA COPYRIGHT 2000 ACS
131:260030 Nonpoisoning fuel cell and methods of operating the same with carbonaceous fuels. Yepez, Omar (Westfield Trading Corporation, USA). PCT Int. Appl. WO 9953560 A1 19991021, 39 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX,

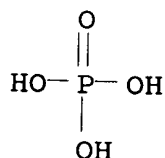
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English).
 CODEN: PIXXD2. APPLICATION: WO 1998-US7373 19980408.

AB Fuel cell of the type that uses, as a fuel, a carbon compd. which undergoes electrooxidn. in the fuel cell comprises: a cathode, an electrolyte, and an anode. The anode has a first face that is fluid permeable and a second face which is in contact with the electrolyte. The second face comprises an at. hydrogen transmissive **membrane** made of an electrocatalytic metallic element which stores and **diffuses hydrogen** in at. form. This **membrane** has an absorption side and an opposite insertion reaction side. There is also provided a method of generating electricity in a fuel cell as described generally and in any of the specific embodiments described above. This method comprises the sequential steps of: absorbing a hydrogen contg. medium on the absorption side of the at. hydrogen transmissive **membrane**, passing hydrogen in at. form, through the **membrane** to the opposite insertion reaction side of this **membrane**, providing a carbon compd. to this insertion reaction side, allowing the direct electrooxidn. reaction of the carbon compd. on the insertion reaction side to give an electrooxidn. product, chem. reacting this with the hydrogen passed through the **membrane** to give a redn. reaction product, further electrooxidizing this redn. reaction product to provide carbon dioxide, as the principal product of the complete electrochem. oxidn. of the carbon compd.; and drawing electricity generated thereby in the fuel cell from its cathode and anode.

IT 7664-38-2, Phosphoric acid, uses 9002-84-0
 (nonpoisoning fuel cell and methods of operating with
 carbonaceous fuels)

RN 7664-38-2 HCA

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



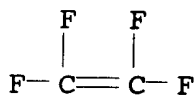
RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4



- IC ICM H01M008-08
ICS H01M008-10; H01M004-86
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
- IT 144-55-8, Sodium bicarbonate, uses 7664-38-2, Phosphoric acid, uses 9002-84-0
(nonpoisoning fuel cell and methods of operating with carbonaceous fuels)
- L91 ANSWER 6 OF 26 HCA COPYRIGHT 2000 ACS
131:229503 Effect of plasticizers on the microstructure and conductive properties of polymeric ionomers from EPDM. Bashir, H.; Linares, A.; Acosta, J. L. (Instituto de Ciencia y Tecnologia de Polimeros del CSIC, Madrid, 28006, Spain). Rev. Plast. Mod., 77(515), 529-535 (Spanish) 1999. CODEN: RPMOAM. ISSN: 0034-8708. Publisher: Asociacion para el Fomento de la Ciencia y de la Tecnica.
- AB Proton-conducting ionomers based on high-norbornene EPDM (Vistalon 9500, Exxon Chem.) were obtained by sulfonation of EPDM using acetyl sulfate prep'd. in situ from acetic anhydride and H₂SO₄. The sulfonated polymer was formulated with plasticizers by kneading at room temp.; the material was press-molded to form membranes and the membranes were characterized by DSC, dynamic mech. anal., photoelectronic spectrometry, and complex impedance spectroscopy. The cond. of the membranes increased with level of hydration of the membrane, even if the no. of sulfonate groups is not the largest, in fact, larger content of sulfonate groups results in a more rigid structure that prevents diffusion of water and adversely affects cond. Conventional plasticizers, Bu phthalate and paraffin oil enhance processability and dimensional stability of the membranes but cause a decrease in cond. due to poor hydrophilicity and swelling. The membranes are suitable for use in solid-state fuel cells.
- CC 37-5 (Plastics Manufacture and Processing)
Section cross-reference(s): 38, 52
- ST sulfonated EPDM ionomer membrane microstructure water diffusion; plasticizer effect morphol sulfonated EPDM membrane; fuel cell membrane sulfonated EPDM ionomer
- IT EPDM rubber
(Vistalon 9500, sulfonated; role of sulfonation level and plasticizers on microstructure and diffusivity of proton conductive ionomer EPDM membranes)
- IT Ionic conductivity
(proton; role of sulfonation level and plasticizers on microstructure and diffusivity of proton

- conductiv ionomer EPDM m mbranes)**
- IT Hydrophilicity
Plasticizers
Polymer morphology
Sulfonation
Swelling, physical
(role of sulfonation level and plasticizers on microstructure and **diffusivity of proton conductive ionomer EPDM membranes)**)
- IT Paraffin oils
(role of sulfonation level and plasticizers on microstructure and **diffusivity of proton conductive ionomer EPDM membranes)**)
- IT Diffusion
(water; role of sulfonation level and plasticizers on microstructure and **diffusivity of proton conductive ionomer EPDM membranes)**)
- IT 7732-18-5, Water, processes
(diffusion; role of sulfonation level and plasticizers on microstructure and **diffusivity of proton conductive ionomer EPDM membranes)**)
- IT 84-74-2, Butyl phthalate
(role of sulfonation level and plasticizers on microstructure and **diffusivity of proton conductive ionomer EPDM membranes)**)
- L91 ANSWER 7 OF 26 HCA COPYRIGHT 2000 ACS
- 130:268018 Proton-conducting phosphoric acid polyesters. Florjanczyk, Zbigniew; Bzducha, Wojciech; Wroblewski, Robert; Cieslicki, Pawel; Zygadlo-Monikowska, Ewa (Wydz. Chemiczny, Politechnika Warszawska, Warsaw, 00-664, Pol.). Polimery (Warsaw), 44(1), 18-23 (Polish) 1999. CODEN: POLIA4. ISSN: 0032-2725. Publisher: Instytut Chemii Przemyslowej.
- AB Arom. and aliph. polyesters of phosphoric acid were studied as potential components of **proton-conducting membranes**. The arom. esters were obtained by hydrolysis of the products of condensation of **phosphorus oxychloride** with bisphenol A; the aliph. polyesters were obtained by polyaddn. of phosphoric acid to diglycidyl ether of bisphenol A. The arom. derivs. were found to be hydrolytically stable enough to be applicable as components of proton-conducting hydrogels. The ionic conductivities of the composite **membranes** of the polyesters and of N,N'-methylenediacrylamide and poly(vinylidene fluoride) ranged from 10⁻⁴ to 10⁻³ S.cntdot.cm⁻¹. The aliph. polyesters hydrolyzed with water at room temp. to yield low-mol.-wt. oligomers and even after having been immobilized in hydrophobic polymeric networks were easy to wash out. They can be used to synthesize conducting gels with org. solvents used as the conducting phase.
- CC 37-3 (Plastics Manufacture and Processing)
Section cross-reference(s): 76
- ST phosphoric acid polyester gel prepn elec cond; **proton**

- IT **conducting membrane phosphoric acid polyester gel**
M mbranes (nonbiological)
 (elec. **conductiv** ; prepn. of **proton-**
conducting phosphoric acid polyesters and
membranes based on them)
- IT Polymer blends
 (polyvinylidene fluoride-phosphoric acid polyester; prepn. of
proton-conducting phosphoric acid polyesters
 and **membranes** based on them)
- IT Conducting polymers
Proton conductivity
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- IT Ionomers
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- IT Fluoropolymers, uses
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- IT 110-26-9DP, N,N'-Methylenebis(acrylamide), polymers with hydrolyzed
 bisphenol A-phosphonyl trichloride copolymer 62765-05-3DP,
 Bisphenol A-phosphonyl trichloride copolymer, sru, hydrolyzed,
 optionally N,N'-methylenebis(acrylamide)-crosslinked 68664-05-1DP,
 Bisphenol A-phosphonyl trichloride copolymer, hydrolyzed, optionally
 N,N'-methylenebis(acrylamide)-crosslinked
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- IT 24937-79-9, Polyvinylidene fluoride
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- IT 62765-05-3P, Bisphenol A-phosphonyl trichloride copolymer, sru
 68664-05-1P, Bisphenol A-phosphonyl trichloride copolymer
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- IT 126710-34-7P
 (prepn. of **proton-conducting** phosphoric acid
 polyesters and **membranes** based on them)
- L91 ANSWER 8 OF 26 HCA COPYRIGHT 2000 ACS
- 130:224122 Gas separation **membranes** based on regiospecific
 polyamide-polyimides. Langsam, Michael (Air Products and Chemicals,
 Inc., USA). Eur. Pat. Appl. EP 900588 A1 19990310, 14 pp.
 DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI,
 LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN:
 EPXXDW. APPLICATION: EP 1998-116572 19980902. PRIORITY: US
 1997-924729 19970905.
- AB The polyamide-polyimides are cast to form
membranes which exhibit superior gas sepn. properties when
 compared to polyamide-polyimide **membran s** formed from
 random copolymers. The polymers are prepd. by reacting specific
 arom. diimide dicarboxylic acids with select arom.
 diamines.

- IC ICM B01D071-64
ICS B01D053-22; C08G073-14
- CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 35
- ST regiospecific polyamide polyimide **membrane**; nitrogen oxygen sepn polyamide polyimide **membrane**; arom diimide dicarboxylic acid diamine copolymer
- IT **Membranes** (nonbiological)
(gas-sepn.; gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- IT Polyimides, uses
(polyamide-; gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- IT Polyamides, uses
(polyimide-; gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- IT **Polyphosphazenes**
Polysiloxanes, uses
(thin films, for **membrane** coatings; gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- IT 61736-00-3P 193143-36-1P 221012-84-6P 221012-85-7P
221012-86-8P 221012-87-9P 221012-88-0P 221012-89-1P
221012-90-4P 221012-91-5P 221012-92-6P 221012-93-7P
221012-94-8P 221012-95-9P 221012-96-0P 221012-97-1P
221012-98-2P 221012-99-3P 221013-00-9P 221013-01-0P
221013-02-1P 221013-03-2P 221045-98-3P 221045-99-4P
221046-00-0P 221046-01-1P 221046-02-2P 221046-08-8P
221046-14-6P 221046-23-7P 221105-85-7P 221107-44-4P
221107-45-5P 221107-46-6P
(gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- IT 552-30-7, Trimellitic anhydride 823-40-5, 2,6-Toluenediamine
(gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- IT 4649-31-4P 4649-33-6P 159523-76-9P 160072-12-8P 221012-81-3P
221105-84-6P
(gas-sepn. **membranes** based on regiospecific polyamide-polyimides)
- L91 ANSWER 9 OF 26 HCA COPYRIGHT 2000 ACS
130:200850 **Polyphosphazene membranes** and microspheres in periodontal diseases and implant surgery. Veronese, Francesco M.; Marsilio, Franco; Lora, Silvano; Caliceti, Paolo; Passi, Piero; Orsolini, Piero (Department of Pharmaceutical Sciences, University of Padova, Padua, 35128, Italy). Biomaterials, Volume Date 1999, 20(1), 91-98 (English) 1998. CODEN: BIMADU. ISSN: 0142-9612. Publisher: Elsevier Science Ltd..
- AB **Membranes** or microcapsules made from **polyphosphazene** s bearing amino acid side groups are proposed for the treatment of periodontal diseases. **Polyphosphazene m mbranes**, prepd. with alanine Et ester and imidazole in a molar ratio of 80:20 as phosphorus substituents, gave a degrdn. rate

that corresponded to the healing of the bone defect. These membranes were much more successful in promoting healing of rabbit tibia defects than **polytetrafluoroethylene membranes**. Antibacterial or anti-inflammatory drugs, useful in periodontal tissue regeneration, could be entrapped in the **polyphosphazene membranes** and released both in vitro and in vivo at a rate that ensured therapeutic concns. in the surrounding tissue. **Polyphosphazene** microspheres, prepd. with phenylalanine Et ester as a phosphorus substituent and loaded with succinylsulfathiazole or naproxen, were also obtained. The kinetics of release from these matrixes were very convenient in yielding local concns. of the 2 drugs that are useful per se or when mixed with hydroxyapatite for better bone formation.

IT 25231-98-5P, Hexachlorocyclotriphosphazene homopolymer

26085-02-9P, Poly[nitrilo(dichlorophosphoranylidene)]
(polyphosphazene membranes and microspheres

in periodontal diseases and implant surgery)

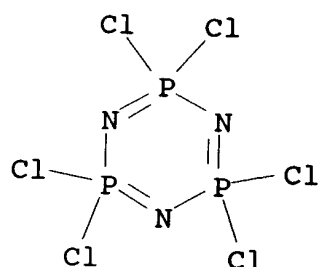
RN 25231-98-5 HCA

CN 1,3,5,2,4,6-Triazatriphosphorine, 2,2,4,4,6,6-hexachloro-2,2,4,4,6,6-hexahydro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

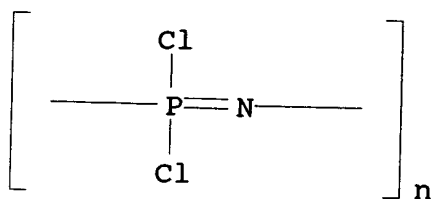
CRN 940-71-6

CMF Cl6 N3 P3



RN 26085-02-9 HCA

CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



IT 25231-98-5DP, Hexachlorocyclotriphosphazene homopolymer, reaction products with amino acids 26085-02-9DP,

Poly[nitrilo(dichlorophosphoranylidene)], reaction products with amino acids

(polyphosphazene membranes and microspheres in periodontal diseases and implant surgery)

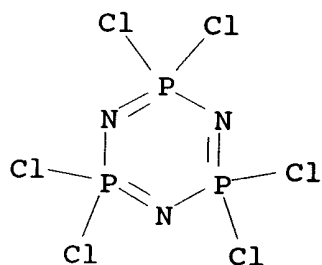
RN 25231-98-5 HCA

CN 1,3,5,2,4,6-Triazatriphosphorine, 2,2,4,4,6,6-hexachloro-2,2,4,4,6,6-hexahydro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

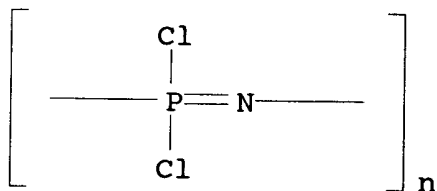
CRN 940-71-6

CMF Cl6 N3 P3



RN 26085-02-9 HCA

CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



CC 63-6 (Pharmaceuticals)

ST polyphosphazene membrane microsphere periodontal disease prepn; implant polyphosphazene membrane prepn

IT Bone defects

Dissolution rate

Periodontal diseases

Prosthetic implants

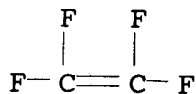
(polyphosphazene membranes and microspheres in periodontal diseases and implant surgery)

IT Polyphosphazenes

(polyphosphazene membranes and microspheres in periodontal diseases and implant surgery)

IT 25231-98-5P, Hexachlorocyclotriphosphazene homopolymer
26085-02-9P, Poly[nitrilo(dichlorophosphoranylidene)]

- (polyphosphazene membranes and microspheres in periodontal diseases and implant surgery)
- IT 288-32-4DP, Imidazole, reaction products with polyphosphazenes 1115-59-9DP, L-Alanine ethyl ester hydrochloride, reaction products with polyphosphazenes 3182-93-2DP, L-PhenylAlanine ethyl ester hydrochloride, reaction products with polyphosphazenes 25231-98-5DP, Hexachlorocyclotriphosphazene homopolymer, reaction products with amino acids 26085-02-9DP, Poly[nitrilo(dichlorophosphorany lidyne)], reaction products with amino acids (polyphosphazene membranes and microspheres in periodontal diseases and implant surgery)
- L91 ANSWER 10 OF 26 HCA COPYRIGHT 2000 ACS
- 130:158450 Use of hyaluronic acid derivatives in the preparation of biomaterials with a physical hemostatic and plugging activity and a preventive activity in the formation of adhesions following anastomosis. Rivarossa, Alberto; Pressato, Daniele (Fidia Advanced Biopolymers, S.R.L., Italy). PCT Int. Appl. WO 9904828 A2 19990204, 60 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1998-EP4716 19980728. PRIORITY: IT 1997-PD170 19970728.
- AB Polysaccharide derivs. are used for the prepn. of biocompatible and biodegradable biomaterials with absorbent properties for body fluids and phys. hemostatic activity. They are used in both venous and arterial vascular anastomoses and to prevent the formation of post-surgical adherence of the vessels with the surrounding tissues scar formation. Autocrosslinked derivs. of hyaluronic acid in the form of a 5% gel was prepd. Rats underwent venous anastomosis in hind limbs and the veins were cover with above gels. The mean bleeding time was reduced and less fibrosis and reduced formation of scar tissue around the treated vessels was obsd.
- IT 9002-84-0, Ptfе
(use of hyaluronic acid derivs. in prepn. of biomaterials with phys. hemostatic and plugging activity and preventive activity in formation of adhesions following anastomosis)
- RN 9002-84-0 HCA
- CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)
- CM 1
- CRN 116-14-3
- CMF C2 F4



- IC ICM A61L015-00
 CC 63-7 (Pharmaceuticals)
 Section cross-reference(s): 35, 38
 IT Adhesion (biological)
 Anti-inflammatory drugs
 Antibiotics
 Antithrombotics
 Biological materials
 Gels (drug delivery systems)
 Gums
 Hemostatics
Membranes (nonbiological)
 Microcapsules (drug delivery systems)
 Microspheres (drug delivery systems)
 Nonwoven fabrics
 Prostheses
 Sutures
 (use of hyaluronic acid derivs. in prepn. of biomaterials with
 phys. hemostatic and plugging activity and preventive activity in
 formation of adhesions following anastomosis)
 IT Collagens, biological studies
 Fluoropolymers, biological studies
 Glycosaminoglycans, biological studies
Polyphosphazenes
 Polysulfones, biological studies
 Polyurethanes, biological studies
 (use of hyaluronic acid derivs. in prepn. of biomaterials with
 phys. hemostatic and plugging activity and preventive activity in
 formation of adhesions following anastomosis)
 IT 1398-61-4, Chitin 9000-69-5, Pectin 9002-18-0, Agar
9002-84-0, Ptfе 9004-34-6, Cellulose, biological
 studies 9005-25-8, Starch, biological studies 9005-32-7, Alginic
 acid 9005-32-7D, Alginic acid, derivs. 9012-36-6, Agarose
 9012-76-4, Chitosan 9046-40-6, Pectic acid 11138-66-2, Xanthan
 gum 26023-30-3, Poly[oxy(1-methyl-2-oxo-1,2-ethanediyl)]
 26100-51-6, Polylactic acid 26124-68-5, Polyglycolic acid
 28552-22-9, Polydioxane 34346-01-5, Lactic acid glycolic acid
 copolymer 142804-65-7D, Gellan, derivs.
 (use of hyaluronic acid derivs. in prepn. of biomaterials with
 phys. hemostatic and plugging activity and preventive activity in
 formation of adhesions following anastomosis)
 L91 ANSWER 11 OF 26 HCA COPYRIGHT 2000 ACS
 130:141587 Sulfonated and crosslinked **polyphosphazene** -based
 proton-exchange **membranes**. Guo, Qunhui; Pintauro, Peter
 N.; Tang, Hao; O'Connor, Sally (Department of Chemistry, Xavier

University, New Orleans, LA, 70125, USA). J. Membr. Sci., 154(2), 175-181 (English) 1999. CODEN: JMESDO. ISSN: 0376-7388. Publisher: Elsevier Science B.V..

- AB Proton-exchange **membranes**, for possible use in H₂/O₂ and direct methanol fuel cells have been fabricated from poly [bis(3-methylphenoxy)**phosphazene**] by first sulfonating the base polymer with SO₃ and then soln.-casting thin films. The ion-exchange capacity of the **membrane** was 1.4 mmol/g. Polymer crosslinking was carried out by dissolving benzophenone photoinitiator in the **membrane** casting soln. and then exposing the resulting films after solvent evapn. to UV light. The crosslinked **membranes** look particularly promising for possible proton exchange **membrane** fuel cell applications. A sulfonated and crosslinked **polyphosphazene membrane** swelled less than Nafion 117 in both water and methanol. Proton conductivities in crosslinked and non-crosslinked 200 .mu.m thick water-equilibrated **polyphosphazene** films at temps. of 25-65.degree. were essentially the same and only 30% lower than those for Nafion 117. Addnl., water and methanol diffusivities in the crosslinked **polyphosphazene membrane** were very low (.ltoreq.1.2 .times. 10⁻⁷ cm²/s). Sulfonated/crosslinked **polyphosphazene** films showed no signs of mech. failure (softening) up to 173.degree. and a pressure of 800 kPa and did not degrade chem. when soaked in a hot hydrogen peroxide/ferrous ion soln.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 38
- ST polymethylphenoxyphosphazene sulfonated crosslinked proton exchange **membrane**; fuel cell proton exchange **membrane**
- IT **Polyphosphazenes**
(phenoxy; prepn. and characterization of sulfonated and crosslinked **polyphosphazene**-based proton-exchange **membranes** for fuel cells)
- IT Fuel cell separators
(prepn. and characterization of sulfonated and crosslinked **polyphosphazene**-based proton-exchange **membranes** for fuel cells)
- IT **Membranes** (nonbiological)
(proton exchange; prepn. and characterization of sulfonated and crosslinked **polyphosphazene**-based proton-exchange **membranes** for fuel cells)
- IT 52233-65-5D, sulfonated
(UV-crosslinked; prepn. and characterization of sulfonated and crosslinked **polyphosphazene**-based proton-exchange **membranes** for fuel cells)

L91 ANSWER 12 OF 26 HCA COPYRIGHT 2000 ACS

128:158068 Study of the factors affecting mass transport in electrochemical gas sensors. Hitchman, Michael L.; Cade, Nigel J.; Gibbs, T. Kim; Headley, Niholas J. M. (Dep. of Pure and Applied Chemistry, University of Strathclyde, Glasgow, G1 1XL, UK). Analyst

(Cambridge, U. K.), 122(11), 1411-1417 (English) 1997. CODEN: ANALAO. ISSN: 0003-2654. Publisher: Royal Society of Chemistry.

AB The effect of various diffusion barriers on the mass transport controlled current for an amperometric gas sensor with a porous **membrane** was studied. A general equation was derived which relates total current to diffusion parameters for each barrier. By varying the thickness of one barrier at a time, keeping all the other parameters const., the relative roles of each barrier was detd. This was done for CO and H₂S sensors; in both cases >70% of transport control was provided by the electrolyte film in the porous electrode/**membrane**. This conclusion was supported by observations of the temp. dependence of sensor currents. It was concluded that, to obtain more consistent, reproducible results from porous **membrane**-covered amperometric gas sensors, a more controllable method of electrode manuf. and assembly is desirable.

IT 9002-84-0, PTFE

(diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)

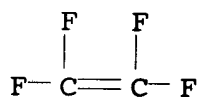
RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4

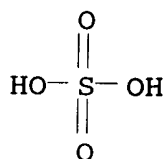


IT 7664-93-9, Sulfuric acid, uses

(sensor electrolyte; diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)

RN 7664-93-9 HCA

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



CC 59-1 (Air Pollution and Industrial Hygiene)

Section cross-reference(s): 47, 79, 80

IT Gas sensors

(amperometric electrochem.; diffusion barrier thickness and temp.

- effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membran**)
- IT Electric current
Mass transfer
(diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)
- IT Fluoropolymers, uses
(diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)
- IT Gas analysis
(toxic; diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)
- IT 630-08-0, Carbon monoxide, analysis 7783-06-4, **Hydrogen** sulfide, analysis
(diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)
- IT 9002-84-0, **PTFE**
(diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)
- IT 7664-93-9, Sulfuric acid, uses
(sensor electrolyte; diffusion barrier thickness and temp. effect on mass transport controlled current in amperometric electrochem. gas sensors equipped with porous **membrane**)

L91 ANSWER 13 OF 26 HCA COPYRIGHT 2000 ACS

128:77667 Cylindrical proton exchange **membrane** fuel cells and methods of making same. Bass, Edward Albert; Merritt, Patrick Martin; Sharp, Christopher Alan; Wall, Craig Marshall; Campbell, John (Southwest Research Institute, USA). PCT Int. Appl. WO 9747052 A1 19971211, 47 pp. DESIGNATED STATES: W: AL, AM, AT, AU, ~~AZ~~, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1997-US9659-19970605. PRIORITY: US 1996-19182 19960605.

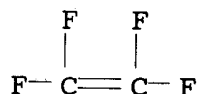
AB Methods are described for manufg. a cylindrical fuel cell comprising providing an anode from a solid cylindrical porous conductive matrix with outer surface intimately contacting a first proton exchange catalyst; conforming an inner polymer electrolyte **membrane**, with outer and inner surface, around and in intimate contact with the anode outer surface, where the **membran** inner surface defines a tubular compartment and ionically communicates with the first proton exchange catalyst; providing a source of hydrogen gas in communication with the first proton exchange catalyst; and,

disposing a cathode comprising a catalytically effective amt. of a second proton exchange catalyst around and in ionic communication with the **membran** outer surface. A source of oxygen gas is in communication with the second proton exchange catalyst. The tubular compartment can be packed with a powder comprising carbon and a first proton exchange catalyst to form the rigid porous anode. The cathode can be formed by packing a mixt. of a carbon powder and catalyst powder into an annular space defined by an inner wall of an outer polymer electrolyte **membrane** tubule and the **membrane** outer surface. In examples, fuel cells were manufd. by soln. casting, using a rolled sheet construction, sputtering, in situ extrusion casting using the electrodes as a mold for precursor gel or soln. of the solid electrolyte **membrane**, or using tubular polymer electrolyte **membranes** to result in a "sausage" type of structure. Current collectors are provided for the anode and cathode.

IT 9002-84-0, Teflon
 (cylindrical proton exchange **membrane** fuel cells and
 manufg. methods)
 RN 9002-84-0 HCA
 CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

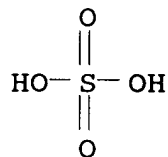
CRN 116-14-3
 CMF C2 F4



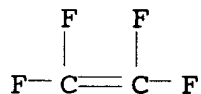
IC ICM H01M004-90
 ICS H01M004-96; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 57
 ST proton exchange **membrane** fuel cell manuf
 IT Casting of polymeric materials
 Extrusion of polymeric materials
 Gas **diffusion** electrodes
 Sputtering
 (cylindrical **proton** exchange **membrane** fuel
 cells and manufg. methods)
 IT Carbon black, uses
 (cylindrical proton exchange **membrane** fuel cells and
 manufg. methods)
 IT Carbon fibers, uses
 Fluoropolymers, uses
 (cylindrical proton exchange **membrane** fuel cells and
 manufg. methods)

- IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT Fuel cells
(proton exchange **membrane**; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT Wire
(stainless steel; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT 7440-06-4, Platinum, uses
(cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT 9002-84-0, Teflon 77950-55-1, Nafion 115
(cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT 1333-74-0, Hydrogen, uses 7782-44-7, Oxygen, uses
(cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT 7440-44-0, Carbon, uses
(paper, powd., sleeve, cloth; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT 7782-42-5, Graphite, uses
(rods; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- IT 12597-68-1, Stainless steel, uses
(screen, cloth, wire; cylindrical proton exchange **membrane** fuel cells and manufg. methods)
- L91 ANSWER 14 OF 26 HCA COPYRIGHT 2000 ACS
124:352798 Preparation of bonded fiber structures for cell implantation. Mikos, Antonios G.; Langer, Robert S. (Massachusetts Institute of Technology, USA). U.S. US 5512600 A 19960430, 7 pp. (English). CODEN: USXXAM. APPLICATION: US 1993-5910 19930115.
- AB A novel processing technique is reported to bond non-woven fibers and, thus, prep. structural interconnecting fiber networks with different shapes for organ implants. The fibers are phys. joined without any surface or bulk modification and have their initial diam. Poly(L-lactic acid) dissolved in methylene chloride was cast into a petri dish contg. a nonwoven mesh of polyglycolic acid fibers to obtain a composite **membrane**, which was heat-treated and then poly(L-lactic acid) matrix was selectively dissolved in methylene chloride to give a bonded polyglycolic acid fiber. The bonded fiber was seeded with hepatocytes for use as a transplantation device.
- IC ICM C08K009-00

NCL 521061000
CC 63-7 (Pharmaceuticals)
Section cross-reference(s): 40
IT **Phosphazene polymers**
Polyanhydrides
Polyester fibers, biological studies
(manuf. of bonded fiber structures for cell implantation)
IT 9003-01-4, Acrylic **acid** polymer 24937-78-8, Ethylene
vinyl acetate copolymer 25087-26-7, Methacrylic **acid**
polymer 26009-03-0, Polyglycolic **acid** 26124-68-5,
Polyglycolic **acid** 26161-42-2 26811-96-1, Poly(L-lactic
acid) 34346-01-5, Lactic **acid**-glycolic
acid copolymer
(manuf. of bonded fiber structures for cell implantation)
L91 ANSWER 15 OF 26 HCA COPYRIGHT 2000 ACS
124:327146 Microelectrode investigation of oxygen permeation in
perfluorinated proton exchange **membranes** with different
equivalent weights. Buechi, Felix N.; Wakizoe, Masanobu;
Srinivasan, Supramaniam (Center Electrochem. Systems Hydrogen Res.,
Tx. Eng. Experiment Station, Texas A & M Univ. System, College
Station, TX, 77843, USA). J. Electrochem. Soc., 143(3), 927-32
(English) 1996. CODEN: JESOAN. ISSN: 0013-4651.
AB The oxygen concns. (Cb) and diffusion coeffs. (D) in various
proton-exchange **membranes** were measured by
chronoamperometry at microelectrodes. These measurements were made
under conditions similar to those prevailing in proton-exchange-
membrane fuel cells. Knowledge of the D and Cb parameters
is essential for the detn. of oxygen permeation in the catalytic
layers of gas diffusion electrodes, which could be rate limiting in
these low-temp. fuel cells. Furthermore, the D and Cb values also
provide the permeation rates of oxygen through the bulk of the
proton-conducting membrane. The concn.
of oxygen increased and the diffusion coeff. decreased with
increasing equiv. wt. of the **membranes**. These results
were interpreted by using a model based on the microstructure of the
swollen **membranes** sepd. into 2 phases, one hydrophobic and
the other hydrophilic, with distinctly different O₂-permeation
properties. According to this model, the relative amts. of the 2
phases in the **membranes**, caused by the different water
contents, det. the O₂ soly. and diffusion coeff. in the different
membrane materials.
IT 7664-93-9, Sulfuric acid, uses
(oxygen permeation in sulfuric acid)
RN 7664-93-9 HCA
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT 9002-84-0, PTFE
 (proton-exchange **membrane**; oxygen permeation in
 perfluorinated proton exchange **membranes**)
 RN 9002-84-0 HCA
 CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 116-14-3
 CMF C2 F4



CC 72-2 (Electrochemistry)
 Section cross-reference(s): 52, 67
 ST microelectrode oxygen permeation proton exchange **membrane**;
 perfluorinated proton exchange **membrane** oxygen permeation;
 fuel cell proton exchange **membrane** oxygen
 IT Diffusion
 (diffusion coeffs. of oxygen in perfluorinated proton exchange
membranes)
 IT **Membranes**
 (oxygen permeation in perfluorinated)
 IT Fuel cells
 (proton-exchange **membrane**; oxygen permeation in
 perfluorinated proton exchange **membranes** for fuel
 cells)
 IT 7440-06-4, Platinum, uses
 (electrode catalyst; oxygen permeation in perfluorinated proton
 exchange **membranes** investigated with platinum
 microelectrodes)
 IT 7664-93-9, Sulfuric acid, uses
 (oxygen permeation in sulfuric acid)
 IT 7782-44-7, Oxygen, properties
 (permeation of oxygen in perfluorinated proton exchange
membranes)
 IT 9002-84-0, PTFE 63346-31-6, Nafion 120
 77950-55-1, Nafion 115 176366-08-8, Aciplex S 885 176366-09-9,
 Aciplex S 1004 176366-10-2, Aciplex S 1104
 (proton-exchange **m mbran** ; oxygen permeation in

perfluorinated proton exchange m mbranes)

L91 ANSWER 16 OF 26 HCA COPYRIGHT 2000 ACS

122:294168 Chemical separations using shell and tube composite **polyphosphazene membranes**. Peterson, E. S.; Stone, M. L.; Orme, C. J.; Reavill, D. A., III (Idaho National Engineering Laboratory, Idaho Falls, ID, 83415, USA). Sep. Sci. Technol., 30(7-9), 1573-87 (English) 1995. CODEN: SSTEDS. ISSN: 0149-6395.

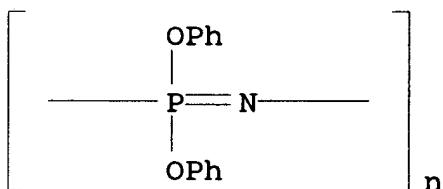
AB Several applications of modular shell-and-tube **polyphosphazene** coated membrane units are reported. These modules were used to measure the mixed-gas sepn. properties of **poly[bis(phenoxy)phosphazene]** based polymers on a larger scale. Transport behavior was detd. using the variable vol. technique. The test gas mixt. was SO₂/N₂ at temps. 80-270.degree.. Transport of these gases was found to be a sorption controlled process. Several org.-aq. and org.-org. sepns. have been performed using the **polyphosphazene** coated shell and tube modules. The sepns. include: methylene chloride/water, acetic acid/water, iso-Pr alc./water, glycerol/water, and hexane/soy oil. The membranes were prepd. using slip casting techniques. The results of these studies show that **polyphosphazene membranes** can effectively be used to sep. acid gases and org. chems. from various waste streams in harsh, chem. aggressive environments.

IT 28212-48-8, Poly[bis(phenoxy)phosphazene]

(chem. sepns. by permeation through shell-and-tube composite **polyphosphazene membranes**)

RN 28212-48-8 HCA

CN Poly[nitrilo(diphenoxyphosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



CC 48-1 (Unit Operations and Processes)

ST chem sepn composite **polyphosphazene membrane**;
permeation sepn composite **polyphosphazene membrane**

IT **Membranes**

Permeability and Permeation

(chem. sepns. by permeation through shell-and-tube composite **polyphosphaz n m mbrans**)

IT 28212-48-8, Poly[bis(phenoxy)phosphaz n]

(chem. sepns. by permeation through shell-and-tube composite

- polyphosphazen membran s)**
- IT 64-19-7P, Acetic acid, preparation
(sepn. of acetic acid by permeation through shell-and-tube composite **polyphosphazene membranes**)
- IT 56-81-5P, Glycerol, preparation
(sepn. of glycerol by permeation through shell-and-tube composite **polyphosphazene membranes**)
- IT 110-54-3P, Hexane, preparation
(sepn. of hexane by permeation through shell-and-tube composite **polyphosphazene membranes**)
- IT 67-63-0P, 2-Propanol, preparation
(sepn. of iso-Pr alc. by permeation through shell-and-tube composite **polyphosphazene membranes**)
- IT 75-09-2P, Methylene chloride, preparation
(sepn. of methylene chloride by permeation through shell-and-tube composite **polyphosphazene membranes**)
- IT 7727-37-9P, Nitrogen, preparation
(sepn. of nitrogen by permeation through shell-and-tube composite **polyphosphazene membranes**)
- IT 7446-09-5P, Sulfur oxide (SO₂), preparation
(sepn. of sulfur dioxide by permeation through shell-and-tube composite **polyphosphazene membranes**)

L91 ANSWER 17 OF 26 HCA COPYRIGHT 2000 ACS

121:256907 Metal Ion-Complexing **Polyphosphazene**

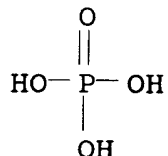
-Interpenetrating Polymer Networks. Visscher, Karyn B.; Allcock, Harry R. (Department of Chemistry, Pennsylvania State University, University Park, PA, 16802, USA). Chem. Mater., 6(11), 2040-50 (English) 1994. CODEN: CMATEX. ISSN: 0897-4756.

AB This synthesis of interpenetrating polymer networks (IPNs) composed of the **polyphosphazenes** [NP(OCH₂CH₂OCH₂CH₂OCH₃)₂]_n (MEEP), or [NP(OC₆H₄COOPr)₂]_n and acidic, ion-complexing org. polymers is reported. These latter polymers included poly(acrylic acid), poly(sodium vinylsulfonate), poly[bis(undecenyl phosphate)], and poly[(p-methyliminodiacetoxy)styrene]. Several of these IPN systems are capable of selective coordination of specific ions and are prototypes for ion-selective **membranes**. Full, sequential IPNs were prep'd., and these materials were characterized by NMR spectroscopy, DSC, and TEM. After metal complexation, the conjugate IPNs were analyzed by electron microscopy and x-ray microanal. The metal coordination was used to enhance domain contrast in these systems for electron microscopy studies. Because the IPNs based on MEEP are of particular interest for ion-selective **membrane** applications, the stability of MEEP in acidic, neutral, and basic aq. media and the response of the polymer to aq. salt solns. was also exam'd.

IT 7664-38-2, Phosphoric acid, uses 7664-93-9,
Sulfuric acid, uses 7697-37-2, Nitric acid, uses
(hydrolysis of **polyphosphazen s** exposed to conc'd.
acids)

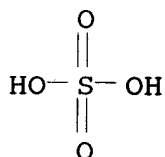
RN 7664-38-2 HCA

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



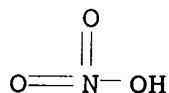
RN 7664-93-9 HCA

CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCA

CN Nitric acid (8CI, 9CI) (CA INDEX NAME)

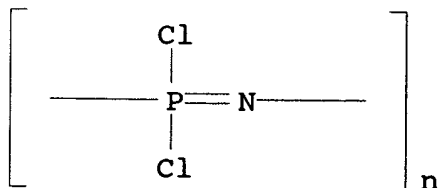


IT **26085-02-9D**, Poly(dichlorophosphazene),
(methoxyethoxy)ethoxy- and propyloxybenzoate group-contg., metal
complexes

(prepn. and characterization of **polyphosphazene-org.**
polymer interpenetrating network metal ion-complexes)

RN 26085-02-9 HCA

CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



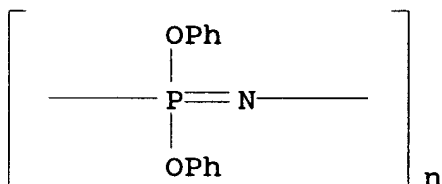
CC 37-3 (Plastics Manufacture and Processing)

ST **polyphosphazene** interpenetrating network metal complex;
polyacrylic acid interpenetrating network **polyphosphaz ne**;
polyvinylsulfonate interpenetrating network **polyphosphazen**
; polybisundecenyl phosphate interpenetrating network

- polyphosphazene** ; polymethyliminodiacetoxystyrene
interpenetrating network **polyphosphazene**
- IT **Phosphazene polymers**
((methoxyethoxy)ethoxy- and propyloxybenzoate group-contg., metal
complexes; prepn. and characterization of **polyphosphazene**
-org. polymer interpenetrating network metal ion-complexes)
- IT Glass temperature and transition
(of **polyphosphazene**-org. polymer interpenetrating
networks)
- IT Polymer morphology
(prepn. and characterization of **polyphosphazene**-org.
polymer interpenetrating network metal ion-complexes)
- IT 7647-01-0, Hydrochloric acid, uses 7664-38-2, Phosphoric
acid, uses 7664-93-9, Sulfuric acid, uses
7697-37-2, Nitric acid, uses
(hydrolysis of **polyphosphazenes** exposed to concd.
acids)
- IT 7439-89-6D, Iron, complexes with **polyphosphazene**-polymer
interpenetrating networks 7439-95-4D, Magnesium, complexes with
polyphosphazene-polymer interpenetrating networks
7439-97-6D, Mercury, complexes with **polyphosphazene**
-polymer interpenetrating networks 7440-22-4D, Silver, complexes
with **polyphosphazene**-polymer interpenetrating networks
7440-50-8D, Copper, complexes with **polyphosphazene**-polymer
interpenetrating networks 7440-66-6D, Zinc, complexes with
polyphosphazene-polymer interpenetrating networks
7440-70-2D, Calcium, complexes with **polyphosphazene**
-polymer interpenetrating networks 9002-97-5D, Poly(sodium
vinylsulfonate), metal complexes 9003-01-4D, Poly(acrylic acid),
metal complexes 26085-02-9D, Poly(dichlorophosphazene),
(methoxyethoxy)ethoxy- and propyloxybenzoate group-contg., metal
complexes 30395-28-9D, metal complexes 82280-45-3D, metal
complexes
(prepn. and characterization of **polyphosphazene**-org.
polymer interpenetrating network metal ion-complexes)
- L91 ANSWER 18 OF 26 HCA COPYRIGHT 2000 ACS
- 118:65825 ~~Mixed-gas~~ separation properties of **phosphazene**
polymer membranes. Peterson, E. S.; Stone, M. L.;
McCaffrey, R. R.; Cummings, D. G. (Idaho Natl. Eng. Lab., Idaho
Falls, ID, 83415, USA). Sep. Sci. Technol., 28(1-3), 423-40
(English) 1993. CODEN: SSTEDS. ISSN: 0149-6395.
- AB The mixed-gas sepn. properties of **poly[bis(phenoxy)**
phosphazene] based **polymers** are reported.
Transport behavior was detd. using the variable vol. technique.
Test gases were run as mixed-gas pairs including SO₂/N, H₂S/CH₄, and
CO₂/CH₄. Transport of these gases was a sorption controlled process
since these gases significantly deviated from the diffusion
controlled permeability-size correlation. **Membranes** were
prepd. using soln. casting techniques. Solvent evapn.
rate during the casting and subsequent curing processes
was controlled to provide a consistent **membran**

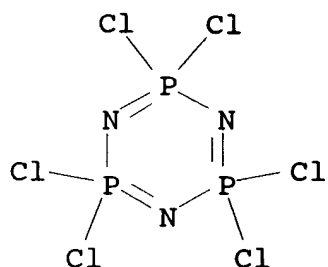
microstructure. **Polyphosphazene membranes** can effectively be used to sep. acid gases from various aggressive waste streams.

IT **28212-48-8, Poly[bis(phenoxy)phosphazene]**
]
 (membrane, for mixed gas sepn., waste gas treatment)
 RN 28212-48-8 HCA
 CN Poly[nitrilo(diphenoxyphosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)

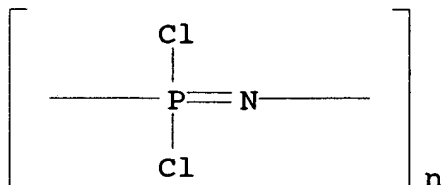


CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 38
 ST **phosphazene polymer membrane gas sepn**
 IT Waste gases
 (acid gas sepn. from, **polyphosphazene membranes** for)
 IT **Membranes**
 (phosphazene polymers, for sepn. of gases, waste gas treatment in relation to)
 IT **Phosphazene polymers**
 (bis(carboxyphenoxy), membrane, for mixed gas sepn., waste gas treatment)
 IT **Phosphazene polymers**
 (bis(fluorophenoxy), membrane, for mixed gas sepn., in waste gas treatment)
 IT **Phosphazene polymers**
 (bis(methylphenoxy), membrane, for mixed gas sepn., in waste gas treatment)
 IT **Phosphazene polymers**
 (bis(sulfophenoxy), membrane, for mixed gas sepn., in waste gas treatment)
 IT **28212-48-8, Poly[bis(phenoxy)phosphazene]**
]
 (membrane, for mixed gas sepn., waste gas treatment)
 IT 74-82-8, Methane, miscellaneous
 (sepn. of, from hydrogen sulfide and carbon dioxide, **polyphosphazene membranes** for)
 IT 124-38-9, Carbon dioxide, miscellaneous 7783-06-4, Hydrogen sulfide, miscellaneous
 (sepn. of, from methane, **polyphosphazene membranes** for)
 IT 7446-09-5, Sulfur dioxide, miscellaneous
 (sepn. of, from nitrogen, **polyphosphazene**)

- membran s for)
- IT 7727-37-9, Nitrogen, miscellaneous
(sepn. of, from sulfur dioxide, **polyphosphazene**
membranes for)
- L91 ANSWER 19 OF 26 HCA COPYRIGHT 2000 ACS
- 115:280878 Ionically crosslinkable **poly[bis(carboxyphenoxy) phosphazene]** and its hydrogels and **membranes**.
Allcock, Harry R.; Kwon, Sukky (Pennsylvania Research Corp., USA).
U.S. US 5053451 A 19911001, 7 pp. (English). CODEN: USXXAM.
APPLICATION: US 1990-467821 19900119.
- AB The title polymer (I) with d.p. 8000 and the corresponding cyclic trimer are prepd. by reaction of poly(dichlorophosphazene) and hexachlorocyclotriphosphazene, resp., with p-NaOC₆H₄CO₂Et and hydrolysis of the intermediate with tert-BuOK. A DMSO soln. of I was **cast** to give a film that was crosslinked and aq. CuSO₄, and solns. of I and Na₂CO₃ solns. were crosslinked to gels by CaCl₂, CuCl₂, CuBr₂, and Al(OAC)₃.
- IT **25231-98-5DP**, Hexachlorocyclotriphosphazene homopolymer, carboxyphenoxy derivs. **26085-02-9DP**, Poly(dichlorophosphazene), carboxyphenoxy derivs. (manuf. of ionically crosslinkable)
- RN 25231-98-5 HCA
- CN 1,3,5,2,4,6-Triazatriphosphorine, 2,2,4,4,6,6-hexachloro-2,2,4,4,6,6-hexahydro-, homopolymer (9CI) (CA INDEX NAME)
- CM 1
- CRN 940-71-6
- CMF C16 N3 P3

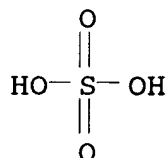


- RN 26085-02-9 HCA
- CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



- IC ICM C08G079-04
 NCL 524600000
 CC 35-8 (Chemistry of Synthetic High Polymers)
 Section cross-reference(s): 37
 IT **Phosphazene polymers**
 (carboxyphenoxy derivs., manuf. of ionically crosslinkable)
 IT Crosslinking agents
 (di- or trivalent metal salts, for poly
 [bis(carboxyphenoxy)phosphazene])
 IT 139-12-8, Aluminum acetate 7447-39-4, Cupric chloride, uses and
 miscellaneous 7758-98-7, Sulfuric acid copper(2+) salt
 (1:1), uses and miscellaneous 7789-45-9, Cupric bromide
 10043-52-4, Calcium chloride, uses and miscellaneous
 (crosslinking agents, for poly[bis(carboxyphenoxy)
 phosphazene])
 IT **25231-98-5DP**, Hexachlorocyclotriphosphazene homopolymer,
 carboxyphenoxy derivs. **26085-02-9DP**,
 Poly(dichlorophosphazene), carboxyphenoxy derivs.
 (manuf. of ionically crosslinkable)
- L91 ANSWER 20 OF 26 HCA COPYRIGHT 2000 ACS
 113:117526 Preparation of ion-conducting **membranes**. Yasuda,
 Ayumi; Yamaga, Noriyuki (Matsushita Electric Works, Ltd., Japan).
 Jpn. Kokai Tokkyo Koho JP 01309213 A2 19891213 Heisei, 6 pp.
 (Japanese). CODEN: JKXXAF. APPLICATION: JP 1988-101877 19880425.
 PRIORITY: JP 1987-312623 19871210.
- AB The title **membranes** for secondary battery or electrode
 materials are prepd. by evapg. a perfluorosulfonate polymer soln. to
 obtain a solid polymer, immersing the solid polymer into an aq.
 soln. or acid contg. the desired cations (e.g., H and/or alkali
 metal ions) to form a perfluorosulfonic acid polymer soln., and then
casting the perfluorosulfonic acid polymer soln. onto a
 glass plate. Thus, a 5 wt.% Nafion soln. was evapd. at 50.degree.
 and 10 torr to give a solid polymer, which was then immersed
 repeatedly in 1N H2SO4 for 1 h to exchange cations and to
 obtain a perfluorosulfonic acid polymer soln., followed by
casting onto a glass plate to produce a H+-
conducting membrane with thickness .apprx.1 .mu.m.
- IC ICM H01B013-00
 ICS B01J047-12; B05D007-24; C08L027-12; H01G009-00; H01M010-40
 CC 47-2 (Apparatus and Plant Equipment)
 Section cross-reference(s): 72
 ST ion conducting **membran** electrode; perfluorosulfonic acid

- polymer **membrane**
 IT Batteries, secondary
 Electrodes
 (ion-conducting **membranes** for, from perfluorosulfonic
 acid polymers)
 IT **Membranes**
 (perfluorosulfonic acid polymers, ion-conducting, manuf. of)
 IT Cation exchangers
 (**membranes**, casting of Nafion)
 IT Sulfonic acids, polymers
 (perfluoro, polymers, ion-conducting **membranes** from)
- L91 ANSWER 21 OF 26 HCA COPYRIGHT 2000 ACS
 112:186478 Ion and solvent transport in ion-exchange **membranes**
 . II. A radiotracer study of the sulfuric-acid, Nafion-117 system.
 Verbrugge, Mark W.; Hill, Robert F. (Phys. Chem. Dep., Gen. Mot.
 Res. Lab., Warren, MI, 48090-9055, USA). J. Electrochem. Soc.,
 137(3), 893-9 (English) 1990. CODEN: JESOAN. ISSN: 0013-4651.
 AB Radiotracer techniques are developed to measure the H⁺ and HSO₄⁻ ion
 diffusion coeffs. in Nafion 117 **membranes** contg. aq.
H₂SO₄. The ³⁵S isotope was used to mimic the more-abundant,
 naturally occurring ³²S in obtaining the HSO₄⁻ diffusion coeff. In
 a novel development, the H⁺ diffusion coeff. was obtained by also
 utilizing ³⁵S transport rates. A single, concn.-independent
 diffusion coeff. is found to represent accurately HSO₄⁻ transport
 over concns. ranging from 0.003-1.0M **H₂SO₄**; this lends
 substantial support to understanding of the phenomena occurring
 within these **membranes**. A Bruggeman-type relation (which
 incorporates structural information of a porous medium so as to
 relate the diffusion coeffs. within the porous phase to those of a
 free soln.) is shown to represent surprisingly well the HSO₄⁻
 diffusion coeff., which **casts** doubt on previously proposed
 structure theories for this class of materials. These results
 indicate that the **membrane** pores are of approx. uniform
 cross-sectional area and 60 .ANG. in breadth.
 IT **7664-93-9**, Sulfuric acid, properties
 (diffusion coeffs. of ions in Nafion 117 **membrane** in
 contact with aq.)
 RN 7664-93-9 HCA
 CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



- CC 66-4 (Surface Chemistry and Colloids)
 Section cross-reference(s): 72
 ST ion exchanger m mbran bisulfate diffusion; sulfur 35

tracer ion diffusion; sulfuric acid Nafion 117 membran

IT Diffusion
(of bisulfate and hydrogen ions, in Nafion 117 membranes, radiotracer study of)

IT 7664-93-9, Sulfuric acid, properties
(diffusion coeffs. of ions in Nafion 117 membrane in contact with aq.)

IT 12408-02-5, Hydrogen ion, properties 14996-02-2, Sulfate (HSO₄⁻), properties
(diffusion coeffs. of, in Nafion 117 membranes)

IT 66796-30-3, Nafion 117
(membranes, bisulfate and hydrogen ion diffusion in)

L91 ANSWER 22 OF 26 HCA COPYRIGHT 2000 ACS

111:98655 Preparation of multilayer permselective membranes. Nakamura, Hide; Yamamoto, Hirotsugu; Takahashi, Kazuhiro (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 01030620 A2 19890201 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-186689 19870728.

AB The title membranes are prepd. by laminating porous substrates and highly permeable middle layers (e.g., siloxanes, polyphosphazenes, polysilylacetylenes), exposing the middle layers to UV light, coating with dispersions of polymers promoting gas sepn., and drying. A C₂Cl₃F₃ soln. of di-Me siloxane was cast on a nonwoven polyester-reinforced polysulfone, dried, exposed to UV, dipped in a C₂Cl₃F₃ soln. of 100:1 poly(vinyl pivalate)-Blemmer PE350, and dried to give a membrane with O permeability 0.45 m³/m²-h-atm and O-N sepn. index 3.9; vs. 0.96 and 2.3, resp., without UV irradiation.

IT 9002-84-0
(porous, laminates with siloxanes or polyphosphazenes, for permselective membranes)

RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4



IC ICM B01D053-22

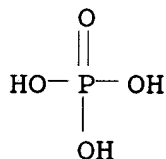
CC 38-3 (Plastics Fabrication and Uses)

ST polyvinyl pivalate m membran permselective; siloxane membran permselective; oxygen sepn air m mbrane;

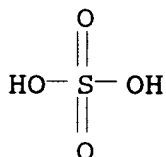
- membran** permselective composite; polysulfone
membran permselective
- IT Polyamides, uses and miscellaneous
 Polyesters, uses and miscellaneous
 Polyimides, uses and miscellaneous
 Polysulfones, uses and miscellaneous
 (porous, laminates with siloxanes or **polyphosphazenes**,
 for permselective **membranes**)
- IT Siloxanes and Silicones, uses and miscellaneous
 (amino-contg., UV-irradiated, in composite permselective
membranes)
- IT Siloxanes and Silicones, uses and miscellaneous
 (di-Me, UV-irradiated, in composite permselective
membranes)
- IT **Phosphazene polymers**
 (fluoroalkoxy, UV-irradiated, in composite permselective
membranes)
- IT **Membranes**
 (permselective, composite, for gas sepn.)
- IT Polysulfones, uses and miscellaneous
 (polyether-, porous, laminates with siloxanes or
polyphosphazenes, for permselective **membranes**)
- IT Polyethers, uses and miscellaneous
 (polysulfone-, porous, laminates with siloxanes or
polyphosphazenes, for permselective **membranes**)
- IT Glass, oxide
 (porous, laminates with siloxanes or **polyphosphazenes**,
 for permselective **membranes**)
- IT 9016-80-2 25736-86-1, Blemmer PE350 26715-88-8 87842-32-8
 120693-09-6 122374-98-5 122374-99-6
 (laminates with siloxanes or **polyphosphazenes**, for
 permselective **membranes**)
- IT **9002-84-0** 9003-07-0 9004-34-6D, Cellulose, esters
 24937-79-9, Poly(vinylidene fluoride) 25014-41-9
 (porous, laminates with siloxanes or **polyphosphazenes**,
 for permselective **membranes**)
- L91 ANSWER 23 OF 26 HCA COPYRIGHT 2000 ACS
- 108:188070 Water-insoluble **proton-conducting**
membranes. Zupancic, Joseph J.; Swedo, Raymond J.;
 Petty-Weeks, Sandra (UOP Inc., USA). U.S. US 4708981 A 19871124, 7
 pp. (English). CODEN: USXXAM. APPLICATION: US 1985-807727
 19851211.
- AB Title **membranes**, useful for gas sepg. and sensing,
 comprise interpenetrating networks of a host compn. contg.
H2SO4 or **H3PO4** and polymers from unsatd. compds.,
 ethylene oxide, ethylenimine, or phenol-HCHO mixts., and a guest
 polymer formed from a monofunctional acrylic monomer different from
 that of the host polymer and difunctional acrylic crosslinking
 agents. Thus, solns. of 0.5 g poly(vinyl alc.) and 0.2 mL 85%
H3PO4, and 2 g methylenebisacrylamide and 30.1 g methacrylic
 acid were prepd. in 25 mL boiling water and water, resp. Mixing 6.7

mL and 10 mL of each soln., pouring into a polycarbonate Petridish, drying and irradiating with electron beam gave a **m mbran** . Cutting the **membran** into disk, sputter-depositing Pt electrodes on both sides of the disk, assembling this **membrane** onto a **Teflon** holder, and connecting with electricity through Cu platens while maintaining 1 atm. H pressure on 1 side and exposing the other side to a mixt. of 10% H and 90% N for 24 h showed an output emf. (EMF) 29.2 mV and resistivity 2.0 .times. 106 .OMEGA.-cm. This was compared to an output EMF 0.1 mV when 100% H was present on both sides of the **membrane**.

IT **7664-38-2**, uses and miscellaneous **7664-93-9**, uses and miscellaneous
 (membranes contg., interpenetrating-polymer blend-based, **proton-conducting** water-insol., for gas sepg. and sensing)
 RN **7664-38-2** HCA
 CN **Phosphoric acid** (7CI, 8CI, 9CI) (CA INDEX NAME)



RN **7664-93-9** HCA
 CN **Sulfuric acid** (8CI, 9CI) (CA INDEX NAME)



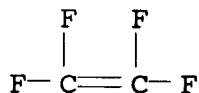
IC ICM C08L029-04
 ICS C08L033-02; C08L041-00; C08L043-02
 NCL 525059000
 CC 38-3 (Plastics Fabrication and Uses)
 Section cross-reference(s): 72
 ST **membrane** gas sepn; sensor gas **membrane**; hydrogen sensor **membrane**; permselective **membrane** **proton conducting** polymer; electrolyte thin film gas sepn; polyvinyl alc **membrane** gas sensor; phosphoric acid **membrane** gas sensor; acrylamide polymer **membrane** gas sensor
 IT **Membran s**
 (permselective, for gas sepg. and sensing, interpenetrating polymer blends for, water-insol., **proton-conducting**)

- IT 7664-38-2, uses and miscellaneous 7664-93-9, uses and miscellaneous
(membran s contg., interpenetrating-polymer blend-based, **proton-conducting** water-insol., for gas sepg. and sensing)
- IT 25034-58-6 30280-72-9, Acrylic acid-methylenebisacrylamide copolymer 30421-16-0, Methacrylic acid-methylenebisacrylamide copolymer 114239-64-4, N,N-Diallylacrylamide-methacrylic acid copolymer
(permselective **membrane** composites contg. acid-modified polymer and, water-insol., **proton-conducting**, for gas sepg. and sensing)
- IT 9002-89-5, Poly(vinyl alcohol) 9002-98-6 9003-01-4, Poly(acrylic acid) 9003-05-8, Poly(acrylamide) 9003-35-4, Formaldehyde-phenol copolymer 25014-15-7, Poly(2-vinylpyridine) 25087-26-7, Poly(methacrylic acid) 25232-41-1, Poly(4-vinylpyridine) 25232-42-2, Poly(N-vinylimidazole) 25322-68-3, Poly(ethylene oxide) 25805-17-8, Poly(2-ethyl-2-oxazoline) 26101-52-0, Poly(vinyl sulfonic acid)
(permselective **membrane** composites contg. crosslinked polymers and acid-modified, water-insol. and **proton-conducting**, for gas sepg. and sensing)
- L91 ANSWER 24 OF 26 HCA COPYRIGHT 2000 ACS
- 107:66556 Electrochemical cells and method of measuring the partial pressure borne by the cells. Jeanne, Francis; Schmidt, Emmanuel; Lombard, Serge (Air Liquide, Societe Anon. pour l'Etude et l'Exploitation des Procedes Georges Claude, Fr.). Fr. Demande FR 2583066 A1 19861212, 34 pp. (French). CODEN: FRXXBL. APPLICATION: FR 1985-8691 19850607.
- AB The title cells selectively transport O₂, a current of O₂⁻, which moves in a polymer matrix inert to O₂⁻; the cells are useful for O₂ sepn. and partial pressure measurement. The O₂⁻ source is preferably an alkali metal superoxide (e.g., NaO₂) or a tetraalkylammonium superoxide (e.g., Me₄NO₂). The inert polymer matrix comprises a compn. selected from polyalkylene oxide (e.g., polypropylene oxide and polyethylene oxide), polyamides, **polyphosphazenes**, polyalkylenimines, fluoropolymers, and quaternary ammonium compd. resins. A cell with an electrolyte contg. polyethylene oxide 4, polypropylene oxide 2, (C₆H₁₃)₄NClO₄ 1, and Bu₄NO₂ 3 wt. parts was operated at 20.degree., with the electrolyte in the form of a disk **membrane** of surface area 3 cm² and thickness 150 .mu.m. The **membrane** was pressed between 2 conductive C disks, which had Au-coated stainless steel contacts. The cell measured an O₂ potential of 39 .+-. 1 mV for O₂ in a mixt. of N₂ 78.91 and O₂ 21.09% at a total pressure of 1 bar.
- IT 9002-84-0, **PTFE**
(in superoxide-conducting electrochem. cell for oxygen sepn. and partial pressure measurement)
- RN 9002-84-0 HCA
- CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4



IC ICM C25B001-02

CC 72-3 (Electrochemistry)

Section cross-reference(s): 38, 76, 79

IT **Phosphazene polymers**

Polyamides, uses and miscellaneous

Polyamines

Polyoxyalkylenes, uses and miscellaneous

(polymer matrix contg., for superoxide-conducting electrochem. cell for oxygen sepn. and partial pressure measurement)

IT **9002-84-0, PTFE**

(in superoxide-conducting electrochem. cell for oxygen sepn. and partial pressure measurement)

L91 ANSWER 25 OF 26 HCA COPYRIGHT 2000 ACS

107:66555 Process for selective oxygen transfer and its application in oxygen production and partial pressure measurement. Jeanne, Francis; Schmidt, Emmanuel; Lombard, Serge (Air Liquide, Societe Anon. pour l'Etude et l'Exploitation des Procedes Georges Claude, Fr.). Fr. Demande FR 2583067 A1 19861212, 37 pp. (French). CODEN: FRXXBL. APPLICATION: FR 1985-8692 19850607.

AB The title cells selectively transport O₂, a current of O₂⁻, which moves in a polymer matrix inert to O₂⁻; the cells are useful for O₂ sepn. and partial pressure measurement. The O₂⁻ source is preferably an alkali metal superoxide (e.g., NaO₂) or a tetraalkylammonium superoxide (e.g., Me₄NO₂). The inert polymer matrix comprises a compn. selected from polyalkylene oxide (e.g., polypropylene oxide and polyethylene oxide), polyamides, **polyphosphazenes**, polyalkyleneimines, fluoropolymers, and quaternary ammonium compd. resins. A cell with an electrolyte contg. polyethylene oxide 4, polypropylene oxide 2, (C₆H₁₃)₄NC104 1, and Bu₄NO₂ 3 wt. parts was operated at 20.degree., with the electrolyte in the form of a disk membrane surface area 3 cm² and thickness 150 .mu.m. The membrane was pressed between 2 conductive C disks, which had Au-coated stainless steel contacts. The cell measured an O₂ potential of 39 .+-. 1 mV for O₂ in a mixt. of N₂ 78.91 and O₂ 21.09% at a total pressure of 1 bar.

IT **9002-84-0, PTFE**

(in superoxide-conducting electrochem. cell for oxygen sepn. and partial pressure measurement)

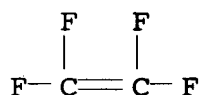
RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4



IC ICM C25B001-02

CC 72-3 (Electrochemistry)

Section cross-reference(s): 38, 76, 79

IT **Phosphazene polymers**

Polyamides, uses and miscellaneous

Polyamines

Polyoxyalkylenes, uses and miscellaneous

(polymer matrix contg., for superoxide-conducting electrochem. cell for oxygen sepn. and partial pressure measurement)

IT **9002-84-0, PTFE**

(in superoxide-conducting electrochem. cell for oxygen sepn. and partial pressure measurement)

L91 ANSWER 26 OF 26 HCA COPYRIGHT 2000 ACS

88:174691 Contribution to the study of cathodic hydrogen diffusion in Armco iron. Part II. Effect of temperature and strain on cathodic hydrogen diffusion in Armco iron. Chene, Jacques (Inst. Phys., Ec. Cent. Arts Mfg., Chatenay-Malabry, Fr.). Met.: Corros.-Ind., 52(623-624), 262-79 (French) 1977. CODEN: MTUXAS. ISSN: 0026-1084.

AB Microg. studies of ferritic structures confirm the fact that differences do arise in such structures as a function of casting conditions. Such differences are useful in detg. the exact influence of cathodic H diffusion and, along with dilatometric studies, define suitable annealing temps. and optimum grain size, and det. the mech. characteristics of Armco Fe. The method utilizes a modified Barrer diffusion technique of diffusing H across a metallic membrane at a measured rate. The electrolytic cell supplying the H was maintained at carefully controlled temps., enabling the detn. of a series of characteristic diffusion coeffs. In addn. to temp. (0-100.degree.) and choice of electrolyte (HCl and H2SO4 are preferred), the method of charging, c.d. (3.5 mA/cm2 is an optimum value), and membrane thickness (0.2 cm optimum value) are significant factors. An interstitial diffusion mechanism is confirmed, but the diffusion pattern is highly distorted by the surface entrapment of H mols.

CC 55-8 (Ferrous Metals and Alloys)

=> d 194 1-12 cbib abs hitstr hitind

L94 ANSWER 1 OF 12 HCA COPYRIGHT 2000 ACS

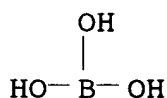
131:118499 Modular ceramic electrochemical **cells** for **fuel cells** and oxygen generators. Crome, Victor Paul; Hart, Russell Frank; Sehlin, Scott Richard (Litton Systems, Inc., USA). Eur. Pat. Appl. EP 932214 A2 19990728, 20 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 1998-116597 19980902. PRIORITY: US 1998-10828 19980122.

AB A ceramic electrolyte element is described which can be injection molded from an electrolyte and a binder. The ceramic element consists of a tube support and a plurality of tubes extending from the tube support. The tubes are arranged in rows and columns. A plurality of vias extend from one surface of the tube support to an opposite surface of the support. The ceramic element is coated with an elec. conductive coating and then with a current collector coating. The vias are coated with the elec. conductive coating and plugged. After the coatings are removed in selected areas of the ceramic element, the tubes of the ceramic element form a series-parallel array because tubes in the same column are connected in parallel elec. and tubes in adjacent rows are connected in series elec. Two ceramic elements are sealed together to form a modular electrochem. cell. The electrochem. cell can be used in an oxygen generator or a **fuel cell**. Oxygen generating capacity can be increased by manifolded together two or more modular oxygen generators.

IT 10043-35-3, Boric acid, uses
(binder; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)

RN 10043-35-3 HCA

CN Boric acid (H3BO3) (6CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM H01M008-24

ICS H01M008-12; H01M008-02; B01D053-32

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 57, 76

ST electrochem cell ceramic modular; oxygen generator modular ceramic
electrochem cell; **fuel cell** modular ceramic
electrochem cell

IT Beeswax

(binder; modular ceramic electrochem. **cells** for **fu l c lls** and oxygen generators)

- IT Carnauba wax
- Hydrocarbon oils
- Paraffin waxes, uses
- Peanut oil
- Polyoxyalkylenes, uses
- Polyoxymethylenes, uses
- (binder; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT Solid electrolytes
- (ceramic, **molded**; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT Hydrocarbon waxes, uses
- (microcryst., binder; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT Electrochemical cells
- Fuel cells**
- (modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT Gas generators
- (oxygen; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT Fats and Glyceridic oils, uses
- (vegetable, binder; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT 56-81-5, 1,2,3-Propanetriol, uses 57-11-4, Octadecanoic acid, uses 112-80-1, 9-Octadecenoic acid (9Z)-, uses 9002-18-0, Agar 9002-86-2, Polyvinyl chloride 9002-88-4, Polyethylene 9002-89-5, Polyvinyl alcohol 9003-07-0, Polypropylene 9003-53-6, Polystyrene 9004-67-5, Methylcellulose **10043-35-3**, Boric acid, uses 24937-78-8, Ethylene vinyl acetate copolymer 25322-68-3
- (binder; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-22-4, Silver, uses 7440-57-5, Gold, uses 11106-95-9 12735-99-8 37206-56-7
- (current collector; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT 108916-22-9, Lanthanum manganese strontium oxide $\text{La}_{0.8}\text{MnSr}_{0.2}\text{O}_3$
- 113514-55-9, Calcium lanthanum manganese oxide $(\text{Ca},\text{La})\text{MnO}_3$
- 126447-16-3, Lanthanum manganese strontium oxide $(\text{La},\text{Sr})\text{MnO}_3$
- 148792-94-3, Barium lanthanum manganese oxide $(\text{Ba},\text{La})\text{MnO}_3$
- 175865-42-6, Cobalt iron lanthanum strontium oxide $((\text{Co},\text{Fe})(\text{La},\text{Sr})\text{O}_3)$
- (electrode; modular ceramic electrochem. **cells** for **fuel cells** and oxygen generators)
- IT 106390-23-2, Bismuth yttrium oxide $\text{Bi}_{1.6}\text{Y}_{0.4}\text{O}_3$ 108706-39-4, Bismuth yttrium oxide $(\text{Bi},\text{Y})_2\text{O}_3$ 122643-22-5, Bismuth gadolinium oxide $((\text{Bi},\text{Gd})_8\text{O}_{12})$ 131600-18-5, Bismuth copper vanadium oxide $\text{Bi}_2\text{Cu}_{0.1}\text{V}_{0.9}\text{O}_{5.35}$ 136854-58-5, Cerium gadolinium oxide $\text{Ce}_{0.8}\text{Gd}_{0.2}\text{O}_2$ 143299-54-1, Yttrium zirconium oxide $\text{Y}_{0.08}\text{Zr}_{0.92}\text{O}_2$

151532-01-3, Bismuth erbium oxide (Bi,Er)2O3 152144-82-6, Bismuth dysprosium oxide (Bi,Dy)2O3 153746-70-4, Bismuth vanadium zirconium oxide 155343-26-3 157911-41-6, Bismuth copper vanadium oxide 163294-91-5, Cerium lanthanum oxide (Ce,La)O2 168045-09-8, Bismuth cobalt vanadium oxide 176205-22-4, Bismuth titanium vanadium oxide 189288-21-9, Yttrium zirconium oxide (Y,Zr)O2 226564-04-1, Cerium yttrium oxide (Ce,Y)O2 233280-39-2, Ytterbium zirconium oxide ((Yb,Zr)O2) 233280-40-5, Scandium zirconium oxide ((Sc,Zr)O2) 233280-41-6, Calcium zirconium oxide ((Ca,Zr)O2) 233280-42-7, Magnesium zirconium oxide ((Mg,Zr)O2) 233280-43-8, Cerium samarium oxide ((Ce,Sm)O2) 233280-44-9, Cerium gadolinium oxide ((Ce,Gd)O2) 233280-45-0, Cerium strontium oxide ((Ce,Sr)O2) 233280-46-1, Bismuth neodymium oxide ((Bi,Nd)2O3) 233280-47-2, Bismuth lanthanum oxide ((Bi,La)2O3) 233280-48-3, Aluminum bismuth vanadium oxide 233280-49-4, Bismuth nickel vanadium oxide 233280-50-7

(electrolyte; modular ceramic electrochem. cells for fuel cells and oxygen generators)

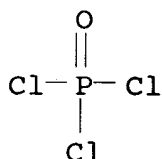
IT 7782-44-7P, Oxygen, preparation
(modular ceramic electrochem. cells for fuel cells and oxygen generators)

L94 ANSWER 2 OF 12 HCA COPYRIGHT 2000 ACS

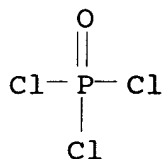
130:5643 High efficiency polycrystalline silicon solar cells using low temperature PECVD process. Elgamel, Hussam Eldin A. (Faculty of Engineering, Cairo University, Cairo, Egypt). IEEE Trans. Electron Devices, 45(10), 2131-2137 (English) 1998. CODEN: IETDAI. ISSN: 0018-9383. Publisher: Institute of Electrical and Electronics Engineers.

AB Conventionally directionally solidified (DS) and silicon film (SF) polycryst. silicon solar cells are fabricated using gettering and low temp. plasma enhanced chem. vapor deposition (PECVD) passivation. Thin layer (.apprx.10 nm) of PECVD SiO2 is used to passivate the emitter of the solar cell, while direct hydrogen rf plasma and PECVD Si3N4 are implemented to provide emitter and bulk passivation. It is found in this work that hydrogen rf plasma can significantly improve the solar cell blue and long wavelength responses when it is performed through a thin layer of PECVD Si3N4. High efficiency DS and SF polycryst. silicon solar cells have been achieved using a simple solar cell process with uniform emitter, Al/POCl3 gettering, hydrogen rf plasma/PECVD Si3N4 and PECVD SiO2 passivation. On the other hand, a comprehensive exptl. study of the characteristics of the PECVD Si3N4 layer and its role in improving the efficiency of polycryst. silicon solar cells is carried out in this paper. For the polycryst. silicon used in this investigation, it is found that the PECVD Si3N4 layer doesn't provide a sufficient cap for the out diffusion of hydrogen at temps. higher than 500.degree.. Low temp. (.ltoreq. 400.degree.) annealing of the PECVD Si3N4 provides efficient hydrogen bulk passivation, while higher temp. annealing relaxes the deposition induced stress and improves mainly the short wavelength (blue) response of the solar cells.

IT 10025-87-3, **Phosphorus oxychloride**
(gettering ambient; high efficiency polycryst. silicon solar
cells using low temp. plasma enhanced CVD process)
RN 10025-87-3 HCA
CN Phosphoric trichloride (9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT 10025-87-3, **Phosphorus oxychloride**
(gettering ambient; high efficiency polycryst. silicon solar
cells using low temp. plasma enhanced CVD process)
L94 ANSWER 3 OF 12 HCA COPYRIGHT 2000 ACS
129:56410 High-efficiency polycrystalline silicon film solar cells.
Elgamel, Hussam Eldin A. (Faculty of Engineering, Cairo
University-Fayoum Campus, Egypt). Sol. Energy Mater. Sol. Cells,
53(3-4), 269-275 (English) 1998. CODEN: SEMCEQ. ISSN: 0927-0248.
Publisher: Elsevier Science B.V..
AB High-efficiency polycryst. silicon film solar cells are fabricated
using gettering and low-temp. plasma-enhanced chem. vapor deposition
(PECVD) passivation schemes. Thin layers (.apprx.10 nm) of PECVD
SiO₂ are used to passivate the emitter of the solar cell,
while direct hydrogen radio-frequency plasma and PECVD
Si₃N₄ are implemented to provide emitter and bulk passivation of the
cells. The combination of Al and POCl₃ gettering is found to be
very effective in improving the minority carrier diffusion length of
the polycryst. silicon film wafers and consequently, the efficiency
of the solar cells. It is shown in this work that hydrogen
radio-frequency plasma treatments can significantly improve the blue
and long wavelength responses of the solar cells when performed
through a thin layer of PECVD Si₃N₄. A very high efficiency of
15.2% on 1 cm² area has been achieved for Si-supported film using a
simple solar cell process with Al/POCl₃ gettering and low-temp.
passivation.
IT 10025-87-3, **Phosphoric trichloride**
(gettering; in fabrication of high-efficiency polycryst. silicon
film solar cells)
RN 10025-87-3 HCA
CN Phosphoric trichloride (9CI) (CA INDEX NAME)



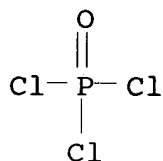
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 IT 7429-90-5, Aluminum, processes 10025-87-3, Phosphoric trichloride
 (gettering; in fabrication of high-efficiency polycryst. silicon film solar cells)
- L94 ANSWER 4 OF 12 HCA COPYRIGHT 2000 ACS
 127:304290 Antimicrobial agent and method for its production with silver compound. Nakajima, Akio; Okayama, Hiroyuki; Ogawa, Takashi; Tanaka, Shuichi; Matsumoto, Akiteru; Moriya, Masafumi (Miyoshi Oil and Fat Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 09249511 A2 19970922 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-84721 19960313.
- AB An antimicrobial agent has a silver coat formed by calcining after adhesion of a powd. silver compd. on a support surface. Thus, .ltoreq.10-.mu. zeolite particles 100 and silver oxide powder 5 parts by wt. were mixed, and after adhesion the mixt. was calcined at 400.degree. for 8 h. The antimicrobial agent (2 g) was kneaded into 100 g of ABS resin, which was then molded into a plate. When the plate was immersed in an Escherichia coli soln. (200 g, initially 5 .times. 10⁵ cells/mL) and shaken, there were no viable cells after 24 h.
- IT 1343-98-2, Silicic acid
 (powder; antimicrobial produced by adhering silver compd. on support and calcining)
- RN 1343-98-2 HCA
 CN Silicic acid (8CI, 9CI) (CA INDEX NAME)
- *** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
- IC ICM A01N059-16
 ICS A01N025-08; A01N025-26
- CC 5-2 (Agrochemical Bioregulators)
 Section cross-reference(s): 42
- IT 1343-98-2, Silicic acid
 (powder; antimicrobial produced by adhering silver compd. on support and calcining)
- L94 ANSWER 5 OF 12 HCA COPYRIGHT 2000 ACS
 126:246484 The cytotoxicity of adenosine 5'-[N,N-di-(.gamma.-o-carboranyl)propyl]phosphorodiamidate in human Tmolt3 leukemic cells. Hall, Iris H.; Elkins, Amy L.; Sood, Anup; Tomasz, Jeno; Spielvogel, Bernard F. (Sch. Pharm., Univ. North Carolina, Chapel Hill, NC, 27599-7360, USA). Anticancer Res., 17(1A), 151-156 (English) 1997. CODEN: ANTRD4. ISSN: 0250-7005. Publisher: Anticancer Research.

AB The title compd. was synthesized and characterized. It demonstrated potent in vivo antineoplastic activity and in vitro cytotoxicity in murine and human leukemia (Tmolt3) and uterine carcinoma tumor cell lines. In human T cell leukemia, DNA formation was preferentially inhibited, with key enzymes in the purine pathway being effectively inhibited. Marginal inhibition of the activities of DNA polymerase .alpha., carbamyl phosphate synthetase, nucleoside kinases, and thymidylate synthetase was obsd. DNA strand scission was obsd. in Tmolt3 cells after 24-h incubation with the substance.

IT 10025-87-3, Phosphoric trichloride
(reaction of adenosine, phosphorous oxychloride, carboranylpropylamine, and diisopropylethylamine)

RN 10025-87-3 HCA

CN Phosphoric trichloride (9CI) (CA INDEX NAME)



CC 1-6 (Pharmacology)

IT 58-61-7, Adenosine, reactions 7087-68-5, N,N-Diisopropylethylamine
10025-87-3, Phosphoric trichloride 140662-87-9
(reaction of adenosine, phosphorous oxychloride, carboranylpropylamine, and diisopropylethylamine)

L94 ANSWER 6 OF 12 HCA COPYRIGHT 2000 ACS

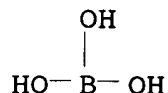
123:88393 Electrode substrates for batteries and fuel cells and their manufacture. Yoneyama, Hiroaki (Mitsubishi Rayon Co, Japan). Jpn. Kokai Tokkyo Koho JP 07105955 A2 19950421 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-246973 19931001.

AB The substrates are composites of carbon or graphite fibers and a carbonaceous material, where the fibers, and optionally the carbonaceous material, contain 0.01-5.0% B or B compds. The substrates are prepd. by kneading B-contg. carbon or graphite short fibers, B or B compds, a thermosetting resin, a pore controlling agent, and an appropriate amt. of water or org. solvent, molding the mixt., removing the solvent, hardening by heating under pressing, and heat treating at .gtoreq.1000.degree. in an inert atm.; or by impregnating carbon or graphite fiber sheets in a soln. of the thermosetting resin contg. B or a B compd., removing the solvent, laminating the sheets, and heat treating at .gtoreq.1000.degree. in an inert atm.

IT 10043-35-3, Orthoboric acid, uses
(manuf. of B-contg. carbon fiber-carbon electrode substrates for batteries and fuel c lls)

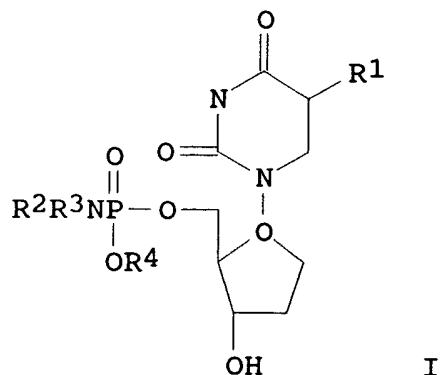
RN 10043-35-3 HCA

CN Boric acid (H3BO3) (6CI, 8CI, 9CI) (CA INDEX NAME)



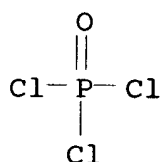
- IC ICM H01M004-88
ICS C25B011-12; H01M004-02; H01M004-04; H01M004-66; H01M004-86;
H01M010-39
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST battery electrode carbon substrate boron; **fuel**
cell electrode substrate
- IT Carbon fibers, uses
(manuf. of B-contg. carbon fiber-carbon electrode substrates for
batteries and **fuel cells**)
- IT Electrodes
(**fuel-cell**, manuf. of B-contg. carbon
fiber-carbon electrode substrates for **fuel**
cells)
- IT Carbon fibers, uses
(graphite, manuf. of B-contg. graphite fiber-carbon electrode
substrates for batteries and **fuel cells**)
- IT 1303-86-2, Boron oxide, uses 10043-35-3, Orthoboric acid,
uses
(manuf. of B-contg. carbon fiber-carbon electrode substrates for
batteries and **fuel cells**)
- IT 121-43-7, Trimethyl borate
(manuf. of B-contg. carbon fiber-carbon electrode substrates for
batteries and **fuel cells**)
- IT 7782-42-5, Graphite, uses
(manuf. of B-contg. graphite fiber-carbon electrode substrates
for **batteries** and **fuel cells**)
- L94 ANSWER 7 OF 12 HCA COPYRIGHT 2000 ACS
- 119:226350 Preparation of phosphoramidate analogs of
5-fluoro-2o-deoxyuridine. Borch, Richard F.; Fries, Kristin M.
(University of Rochester, USA). PCT Int. Appl. WO 9306120 A1
19930401, 47 pp. DESIGNATED STATES: W: CA, JP; RW: AT, BE, CH, DE,
DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE. (English). CODEN:
PIXXD2. APPLICATION: WO 1992-US7792 19920915. PRIORITY: US
1991-763936 19910923.

GI



AB Title compds. I [R1 = H, F, C1-4 alkyl; R2 = XCH2CH2 wherein X = Br, Cl, I, 4-MeC6H4SO2; R3 = C1-4 alkyl, groups for R2; R2R3N = 5-6-membered heterocyclyl aliph. or aliph. interrupted by a ring O or a 2nd ring N; R4 = H, cation, (4,4,6-trimethyltetrahydro-1,3-oxazin-3-yl)ethyl(Q)] and a salt thereof, useful as neoplasm inhibitors, are prepd. Bu4N+ F- in THF was added at 0.degree. to 3'-O-tert-butyldimethylsilyl-5-fluoro-2'-deoxy-5'-uridyl-2-Q-N-Me,-N-(2-bromoethyl)phosphoramidate (prepn. given) to give I (R1 = F, R2 = BrCH2CH2, R3 = Me, R4 = Q) (II). In test against B16 melanoma cells the LC99 of II was 100 .mu.M and IG50 against L210 leukemia cells after 48 h was 2.5 nM.

IT **10025-87-3, Phosphorus oxychloride**
(reaction of, in prepn. of neoplasm inhibitors)
RN 10025-87-3 HCA
CN Phosphoric trichloride (9CI) (CA INDEX NAME)



IC ICM C07H019-10
ICS A61K031-70
CC 33-9 (Carbohydrates)
Section cross-reference(s): 1
IT 50-89-5, Thymidine, reactions 50-91-9, 5-Fluoro-2'-deoxyuridine
67-64-1, Acetone, reactions 109-83-1, 2-(Methylamino)ethanol
110-91-8, Morpholine, reactions 951-78-0, 2'-Deoxyuridine
3068-00-6, 1,2,4-Butanetriol 6091-44-7, Piperidine hydrochloride
10025-87-3, Phosphorus oxychloride
16836-95-6, Silver tosylate 18162-48-6
(reaction of, in prepn. of neoplasm inhibitors)

L94 ANSWER 8 OF 12 HCA COPYRIGHT 2000 ACS

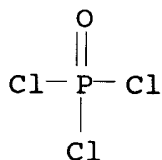
119:4030 Use of haloalkyl derivatives of reporter molecules to analyze metabolic activity in cells. Haugland, Richard P. (Molecular Probes, Inc., USA). PCT Int. Appl. WO 9304192 A1 19930304, 30 pp. DESIGNATED STATES: W: CA, JP; RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE. (English). CODEN: PIXXD2. APPLICATION: WO 1992-US7068 19920821. PRIORITY: US 1991-749256 19910823.

AB A method for analyzing enzyme activity in cells comprises use of compd. XR-REPORTER-BLOCK (I; XR=haloalkyl; BLOCK=group removable by enzyme; REPORTER=mol. which has different spectral properties in its blocked and deblocked forms). Cells are contacted with I under conditions leading to its uptake. Within the cell, the enzyme removes BLOCK and makes REPORTER detectable by absorbance or fluorescence, and the haloalkyl moiety reacts with an intracellular thiol to form a thioether conjugate which is retained in the cell for >1 h. The cells are prepd. for qual. or quant. measurement, and absorbance or fluorescence measurements are made. Various I compds. (e.g., chloromethylfluorescein digalactopyranoside) were prepd. and tested for cytotoxicity, for uptake and retention by cells, and for suitability for detection of intracellular enzymes (e.g. .beta.-galactosidase, glutathione transferase).

IT 10025-87-3, Phosphorus oxychloride
(reaction of, in haloalkyl reporter compd. prepn.)

RN 10025-87-3 HCA

CN Phosphoric trichloride (9CI) (CA INDEX NAME)



IC ICM C12Q001-00

ICS C12Q001-02; C12Q001-34; C12Q001-37; C12Q001-40; C12Q001-42;
C12Q001-44; C12Q001-46; C12Q001-54

CC 7-3 (Enzymes)

Section cross-reference(s): 9

IT 108-46-3, Resorcinol, reactions 111-64-8, Octanoyl chloride
150-19-6, 3-Methoxyphenol 541-41-3, Ethyl chloroformate 591-27-5
638-07-3, Ethyl-4-chloroacetoacetate 3068-32-4 10025-87-3
, Phosphorus oxychloride 16060-65-4
21085-72-3 79955-27-4 147963-31-3
(reaction of, in haloalkyl reporter compd. prepn.)

L94 ANSWER 9 OF 12 HCA COPYRIGHT 2000 ACS

116:135528 Performance-oriented packaging standards; changes to classification, hazard communication, packaging and handling requirements based on UN standards and agency initiative. (United

States Dept. of Transportation, Washington, DC, 20590-0001, USA).
Fed. Regist., 55(246), 52402-729 (English) 21 Dec 1990. CODEN:
FEREAC. ISSN: 0097-6326.

AB The hazardous materials regulations under the Federal Hazardous Materials Transportation Act are revised based on the United Nations recommendations on the transport of dangerous goods. The regulations cover the classification of materials, packaging requirements, and package marking, labeling, and shipping documentation, as well as transportation modes and handling, and incident reporting. Performance-oriented stds. are adopted for packaging for bulk and nonbulk transportation, and SI units of measurement generally replace US customary units. Hazardous material descriptions and proper shipping names are tabulated together with hazard class, identification nos., packing group, label required, special provisions, packaging authorizations, quantity limitations, and vessel stowage requirements.

IT 10025-87-3, Phosphorus oxychloride
(packaging and transport of, stds. for)

L94 ANSWER 10 OF 12 HCA COPYRIGHT 2000 ACS

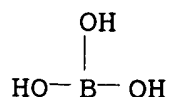
109:76600 Sintering aid for lanthanum chromite refractories used as electronically conductive interconnect layer in fuel cell or other electronic device. Flandermeyer, Brian K.; Poeppel, Roger B.; Dusek, Joseph T.; Anderson, Harlan U. (United States Dept. of Energy, USA). U. S. Pat. Appl. US 922429 A0 19880315, 20 pp. Avail. NTIS Order No. PAT-APPL-6-922 429. (English). CODEN: XAXXAV. APPLICATION: US 1986-922429 19861023.

AB Addns. including a B oxide and a eutectic-forming compn. of Group 2A metal fluorides with Group 3B metal fluorides and Group 2A metal oxides with Group 6B metal oxides lower the required firing temp. of LaCrO₃ in a monolithic structure with electrode materials to permit densification to >94% theor. without degrdn. of electrode material lamina. The monolithic structure is formed by tape casting thin layers of electrode, interconnect, and electrolyte materials and sintering the green lamina together under common densification conditions. Thus, a mixed oxide powder of stoichiometric proportions LaCr_{0.9}Mg_{0.1}O₃ and 10% H₃BO₃ were slurried with Cerbind (CH₂Cl₂, MeCOEt) to form a slip for tape casting. The tape was cast on a substrate and fired at 1600 K to form an integral, elec. conductive layer of >94% theor d.

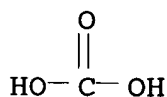
IT 10043-35-3, Boric acid (H₃BO₃), uses and miscellaneous
(sintering aids, for lanthanum chromite for fuel cells and electronic devices)

RN 10043-35-3 HCA

CN Boric acid (H₃BO₃) (6CI, 8CI, 9CI) (CA INDEX NAME)

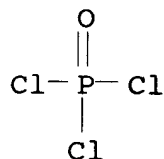


- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 76
- IT **Fuel cells**
(interconnects, lanthanum chromite, sintering aids for)
- IT 1303-86-2, Boron oxide, uses and miscellaneous 1305-78-8, Calcium oxide, uses and miscellaneous 1308-38-9, Chromium oxide, uses and miscellaneous 1309-48-4, Magnesium oxide, uses and miscellaneous 1312-81-8, Lanthanum oxide 10043-35-3, Boric acid (H3BO3), uses and miscellaneous 14060-30-1, Yttrium borate 57456-12-9, Lanthanum borate
(sintering aids, for lanthanum chromite for **fuel cells** and electronic devices)
- IT 115927-76-9, Chromium lanthanum magnesium oxide (Cr0.9LaMg0.1O3)
(sintering of electronically conductive, for **fuel cells** and electronic devices, aids for)
- L94 ANSWER 11 OF 12 HCA COPYRIGHT 2000 ACS
- 104:189698 Performance of molten carbonate **fuel cells** with low pressure electrolyte (I). Sounai, Atsuo; Murata, Kenji; Shirogami, Tamotsu (Toshiba Res. Dev. Cent., Kawasaki, 210, Japan). Denki Kagaku oyobi Kogyo Butsuri Kagaku, 54(2), 143-8 (Japanese) 1986. CODEN: DKOKAZ. ISSN: 0366-9297.
- AB A new type of molten carbonate **fuel cell** composed of the low pressure molded electrolyte layer and the dual porosity electrodes was developed. The electrolyte plate was formed of the mixt. of the alk. carbonate, LiAlO2 powder, Al2O3 fibers, and org. binder under a pressure of .apprx.100 kg/cm2 and a temp. of .apprx.160.degree.. The electrolyte plate became porous after removal of the binder, but mutual cross-leakage of the reaction gases through the cell was prevented by using dual porosity electrodes that allow for penetration of the electrolyte into the fine pores of the electrodes during cell operation.
- IT 463-79-6DP, compds.
(alk. metal salts, **fuel cell** electrolytes contg. molten, manuf. and performance of)
- RN 463-79-6 HCA
- CN Carbonic acid (7CI, 8CI, 9CI) (CA INDEX NAME)



- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **fuel cell** molten carbonate; electrode porous
fuel cell; electrolyte molded
fu l cell
- IT **Fu l c lls**
(molten-carbonate, with low-pressure electrolytes, manuf. and performance of)

- IT 463-79-6DP, compds.
(alk. metal salts, fuel cell electrolytes
contg. molten, manuf. and performance of)
- IT 12003-67-7
(electrolyte contg., molten carbonate fuel cell
, manuf. and performance of)
- IT 1344-28-1P, uses and miscellaneous
(fibers, electrolyte contg., molten carbonate fuel
cell, manuf. and performance of)
- L94 ANSWER 12 OF 12 HCA COPYRIGHT 2000 ACS
90:194551 Discharge reaction mechanisms in lithium/thionyl chloride
cells. Schlaikjer, Carl R.; Goebel, Franz; Marincic, Nikola (Power
Sources Cent., GTE Lab., Inc., Waltham, Mass., USA). J.
Electrochem. Soc., 126(4), 513-22 (English) 1979. CODEN: JESOAN.
ISSN: 0013-4651.
- AB The processes taking place during the discharge of Li/SOCl₂/C cells
were studied. Test vehicles included wound D, bobbin configuration
2D cells, and 200 A-h prismatic cells. Dried
cathodes taken from 2D cells, discharged at 150 mA were analyzed
quant. for Li-S oxyacid salts. Little or no such salt was found for
cells discharged at ambient temp. Measurements of the open-circuit
voltage of this system as a function of temp. showed essentially
linear dependence with pos. slope between +72.degree. and
-20.degree., but the voltage fell more steeply as the temp.
approached -60.degree.. Appearance of a nonvolatile reducing
species occurred in the cathodes of cells discharged at -20.degree.,
which were not present in cathodes from cells discharged at higher
temp. Controlled potential electrolysis of supporting electrolytes
contg. limited amts. of SOCl₂ were carried out between 0 and
25.degree.. The 2000 A-h cells were used to
measure dissolved SO₂ and SO₂ escaping at atm. pressure and ambient
temp. from anode-limited and cathode-limited cells. The amt. of SO₂
produced was found to be only a fraction of that predicted by the
reaction, $4\text{Li} + 2\text{SOCl}_2 \rightarrow \text{S} + \text{SO}_2 + 4\text{LiCl}$, until near the end
of discharge. The total amt. of SO₂ produced by the end of
discharge was not more than predicted by this reaction. Vented,
anode-limited cells did not release SO₂ while cathode-limited cells
did. Temp. cycling of electrolyte taken from cells immediately
after discharge was carried out in a sealed vessel. Pressure
hysteresis occurred, which could not be duplicated with simulated
used electrolyte made with S, SO₂, SOCl₂, LiAlCl₄, and cathode
material. At -20.degree. and below, other discharge reaction
mechanisms are discussed.
- IT 10025-87-3
(thionyl chloride electrochem. redn. on carbon in)
- RN 10025-87-3 HCA
- CN Phosphoric trichloride (9CI) (CA INDEX NAME)



CC 72-2 (Electrochemistry)

IT 10025-87-3

(thionyl chloride electrochem. redn. on carbon in)

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L92 ANSWER 1 OF 17 HCA COPYRIGHT 2000 ACS

133:107320 Novel proton exchange membrane thin-film

fuel cell for microscale energy conversion.

Morse, Jeffrey D.; Jankowski, Alan F.; Graff, Robert T.; Hayes, Jeffrey P. (Lawrence Livermore National Laboratory, Livermore, CA, 94550, USA). J. Vac. Sci. Technol., A, 18(4, Pt. 2), 2003-2005 (English) 2000. CODEN: JVTAD6. ISSN: 0734-2101. Publisher: American Institute of Physics.

AB Thin-film, proton exchange **membrane fuel**

cells are developed using photolithog. patterning, phys. vapor deposition, and spin-cast deposition techniques. In this study, micrometer-thick layers of nickel and platinum electrodes, as well as the **proton conducting** electrolyte layer of perfluorinated sulfonic acid, are synthesized. The anode layer is conductive to pass the elec. current and provides mech. support to the electrolyte and cathode layer that enables combination of the reactive gases. The morphol. desired for both the anode and cathode layers facilitates generation of max. c.d. from the **fuel cell**. For these purposes, the parameters of the deposition process and post-deposition patterning are optimized for continuous porosity across both electrode layers. The power output detd. from current-voltage measurements is characterized at various temps. in the range of 60-90.degree. using dil. (4%) hydrogen fuel.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST proton exchange **membrane fuel cell**

microscale energy conversion

IT Sulfonic acids, uses

(perfluoro, **proton conducting** electrolyte;
development of proton exchange **membrane thin-film**
fuel cells with)

IT **Fuel cells**

(proton exchange **membrane**; development of proton
exchange **membrane thin-film fuel**
cells for microscale energy conversion)

IT Perfluoro compounds

(sulfonic acids, **proton conducting**

- electrolyte; development of proton exchange **m mbrane** thin-film **fu l c lls** with)
- IT 7440-02-0, Nickel, uses 7440-06-4, Platinum, uses (electrode; development of proton exchange **membrane** thin-film **fuel cells** with)
- L92 ANSWER 2 OF 17 HCA COPYRIGHT 2000 ACS
- 133:91702 **Reactor-membrane** permeator process for hydrocarbon reforming and water gas-shift reactions. Ziaka, Zoe D.; Vasileiadis, Savvas (USA). U.S. US 6090312 A 20000718, 13 pp. (English). CODEN: USXXAM. APPLICATION: US 1996-595040 19960131.
- AB New process designs are presented for reforming reactions of steam with hydrocarbons (such as methane, natural gas, light hydrocarbon feedstocks with one to four carbon atoms in each mol.), also for the water gas shift reaction that is of steam with carbon monoxide; also for carbon dioxide reforming of hydrocarbons (such as methane, acidic natural gas, coal gas, landfill gas, light hydrocarbon feedstocks with one to four carbon atoms in each mol.), and the combined reaction of steam carbon dioxide with same hydrocarbons. The processes employ org. polymer, org. polymer-inorg. support, and inorg. **membrane** permeators for species sepn., with the permeators placed after the reactors where the above named reactions take place. The **membranes** in permeators sep. selectively the H₂ and CO₂ species exiting from the reactors from the non-permeated reactants and products. The reject streams coming out of permeators can be recycled into the inlet of the first reactors; these reject streams can be also fed to consecutively placed steam reforming and water gas shift reactors for further conversion to H₂ and CO₂ products. The sepd. H₂ and CO₂ in **membrane** permeate and from the secondary reactions of permeator reject streams, can be used for direct methanol synthesis, feed to molten carbonate **fuel cells**, and other chem. syntheses; after the removal of CO₂ from the mixt., pure hydrogen can be recovered and used in chem. syntheses and as **fuel** in **fuel cells** and power generation cycles.
- IC ICM C07C001-02
- NCL 252373000
- CC 51-4 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 52
- ST **membrane** process hydrocarbon reforming; water gas shift reactor **membrane**
- IT Polyamides, uses
(derivs; reactor-**membrane** permeator process for hydrocarbon reforming and water gas-shift reactions)
- IT Vinyl compounds, uses
(halo, polymers; reactor-**membrane** permeator process for hydrocarbon reforming and water gas-shift reactions)
- IT Waste gases
(landfill; reactor-**m mbran** permeator process for hydrocarbon reforming and water gas-shift reactions)
- IT Coal gas
Flue gases

Membranes, nonbiological

Petroleum reforming

Steam reforming

(reactor-membrane permeator process for hydrocarbon reforming and water gas-shift reactions)

IT Polyamides, uses

Polybenzimidazoles

Polycarbonates, uses

Polyimides, uses

Polyphosphazenes

Polysiloxanes, uses

Polysulfones, uses

(reactor-membrane permeator process for hydrocarbon reforming and water gas-shift reactions)

IT Natural gas, reactions

(reactor-membrane permeator process for hydrocarbon reforming and water gas-shift reactions)

IT 64-19-7D, Acetic acid, derivs, polymers 1314-23-4, Zirconia, uses

1344-28-1, Alumina, uses 7631-86-9, Silica, uses 9003-53-6

13463-67-7, Titania, uses 25038-54-4D, Polycaprolactam, derivs

25722-33-2D, Parylene, derivs

(reactor-membrane permeator process for hydrocarbon reforming and water gas-shift reactions)

IT 64-17-5, Ethanol, reactions 67-56-1, Methanol, reactions

74-82-8, Methane, reactions 74-84-0, Ethane, reactions 74-98-6,

Propane, reactions 75-28-5, Iso-butane 106-97-8, Butane,

reactions

(reactor-membrane permeator process for hydrocarbon reforming and water gas-shift reactions)

L92 ANSWER 3 OF 17 HCA COPYRIGHT 2000 ACS

132:266091 Ionomeric **membranes** based on partially sulfonatedpoly(styrene): synthesis, **proton conduction** and

methanol permeation. Carretta, N.; Tricoli, V.; Picchioni, F.

(Dipartimento di Ingegneria Chimica, Chimica Industriale e Scienza dei Materiali, University of Pisa, Pisa, 56126, Italy). J. Membr.

Sci., 166(2), 189-197 (English) 2000. CODEN: JMESDO. ISSN:

0376-7388. Publisher: Elsevier Science B.V..

AB Homogeneously sulfonated polystyrene (SPS) was prepd. with various concns. of sulfonic acid groups. **Membranes cast**from these materials were investigated in relation to **proton****cond.** and methanol permeability at 20-60.degree.C. It was

found that both these properties increase as the polymer is

increasingly sulfonated, with abrupt jumps occurring at a concn. of sulfonic acid groups of about 15 mol%. The most extensively

sulfonated **membrane** exhibited cond. equal to that ofNafion. As a consequence, this **membrane** material is

potentially an appealing alternative to the very expensive Nafion,

for a no. of electrochem. applications. For the **m mbrane**

with the highest degree of sulfonation we measured a methanol

permeability about 70% smaller than for Nafion. This characteristic is esp. desirable in applications related to the direct methanol

fu 1 cell.

- CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 37, 52, 72
- ST sulfonated polystyrene ionomer **membrane**
- IT Sulfonation
(effect on **proton conduction** and methanol permeation of sulfonated polystyrene ionomer **membranes**)
- IT **Membranes**, nonbiological
Permeation
(prepn., **proton conduction** and methanol permeation of sulfonated polystyrene ionomer **membranes**)
- IT **Fuel cell** separators
(prepn., **proton conduction** and methanol permeation of sulfonated polystyrene ionomer **membranes** for)
- IT **Ionic conductivity**
(**proton**; prepn., **proton conduction** and methanol permeation of sulfonated polystyrene ionomer **membranes**)
- IT Ionomers
(sulfo-contg., **membranes**; prepn., **proton conduction** and methanol permeation of)
- IT 9003-53-6DP, Polystyrene, sulfonated
(ionomer **membranes**; prepn., **proton conduction** and methanol permeation of)
- IT 67-56-1, Methanol, properties
(prepn., **proton conduction** and methanol permeation of sulfonated polystyrene ionomer **membranes**)
- L92 ANSWER 4 OF 17 HCA COPYRIGHT 2000 ACS
- 131:145263 Crosslinked sulfonated polymers and method for preparing same. Michot, Christophe; Armand, Michel (Hydro-Quebec, Can.). PCT Int. Appl. WO 9938897 A1 19990805, 43 pp. DESIGNATED STATES: W: CA, JP, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (French). CODEN: PIXXD2. APPLICATION: WO 1999-CA78 19990129. PRIORITY: CA 1998-2228467 19980130; CA 1998-2236197 19980428.
- AB The invention concerns crosslinked sulfonated polymers, optionally perfluorinated, having ionic charges on the sulfo groups and the method for prepg. them. When they are **molded** in the form of **membranes**, said polymers are useful in **fuel cells** and electrochem. cells, in a chlorine-sodium electrolysis process, as separator in an electrochem. prepn. of org. and inorg. compds., as separator between an aq. phase and an org. phase, or as catalyst for Diels-Alder addns., Friedel-Craft reactions, aldol condensations, cationic polymn., esterification, and acetal formation. Thus, fluorinating a Nafion 117 **membrane** in the Li salt form by Me2NSF2 in THF, reacting the resulting **m mbrane** having SO2F groups 3 h in diglyme under reflux with hexamethyldisilazane Li salt, rinsing with THF, aging the film 48 h in THF contg. Li trimethylsilanoate, rinsing the film with water and EtOH, and exchanging the metal ions for protons by

several immersions in 2 M HNO₃ gave a **membran** with 32% of the sulfonyl groups in the form of sulfonimide and 78% in the form of sulfonate.

- IC ICM C08F008-44
ICS C08G081-00; C08G085-00; C08J005-22
- CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 24, 35, 67, 72
- ST ion group contg crosslinked sulfonated polymer **membrane**
manuf; lithium methyldisilazane crosslinker sulfonated polymer **membrane**
- IT **Fuel cells**
(polymers having ionic charges on sulfo crosslinking groups for **fuel cells**)
- IT **Membranes**, nonbiological
(polymers having ionic charges on sulfo crosslinking groups for **membranes**)
- IT 10028-15-6P, Ozone, preparation
(polymers having ionic charges on sulfo crosslinking groups **membranes** for prodn. of ozone)
- L92 ANSWER 5 OF 17 HCA COPYRIGHT 2000 ACS
130:40853 Low-cost **membranes** for PEM **fuel cells**. Yen, Shiao-Ping "Elizabeth"; Kindler, Andrew; Yavrouian, Andre (Jet Propulsion Laboratory, Pasadena, CA, 91109-8099, USA). Proc. Power Sources Conf., 38th, 469-472 (English) 1998. CODEN: PPOCFD. Publisher: National Technical Information Service.
- AB Arom. semicryst. polymers such as poly p-Ph ether-ether ketone (PEEK) and poly-p-Ph ether sulfone (PES) were used as starting materials to produce **proton conducting** ionomers. These are sulfonated poly p-Ph ether-ether ketone (H-SPEEK) and sulfonated poly-p-Ph ether sulfone (H-SPES), resp. After numerous expts. with these 2 polymers it was detd. that mixt. of HSPES and PES or mixts. of different equiv. wts. of HSPES could be **cast** into useful, robust **membranes**. The newly **prepd. proton conducting membranes** were incorporated into **membrane** electrode assemblies (MEA) and tested as working MeOH **fuel cells**. The best HSPES MEA delivered 387 mV at 300 mA/cm², at 91.degree. and 20 psig air using 1M MeOH.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- ST **fuel cell membrane** sulfonated polymer
- IT **Fuel cells**
(MeOH; low cost **membranes** for PEM **fuel cells**)
- IT Electric conductivity
Fuel cell electrolytes
(low cost **m mbranes** for PEM **fu l cells**)
- IT Polyketones
Polysulfones, uses

- (polyether-, arom., sulfonated; low cost **membran s** for PEM **fuel c lls**)
- IT Polyethers, uses
(polyketone-, arom., sulfonated; low cost **membranes** for PEM **fuel cells**)
- IT Polyethers, uses
(polysulfone-, arom., sulfonated; low cost **membranes** for PEM **fuel cells**)
- IT Ionomers
(**proton conducting**; low cost **membranes** for PEM **fuel cells**)
- IT 25667-42-9 31694-16-3D, Peek, sulfonated
(low cost **membranes** for PEM **fuel cells**)
- IT 67-56-1, Methanol, uses
(low cost **membranes** for PEM **fuel cells**)
- L92 ANSWER 6 OF 17 HCA COPYRIGHT 2000 ACS
- 129:276845 Study of blend **membranes** consisting of nafion.RTM. and vinylidene fluoride-hexafluoropropylene copolymer. Lin, Jung-Chou; Ouyang, Meng; Fenton, James M.; Kunz, H. Russell; Koberstein, Jeffrey T.; Cutlip, Michael B. (Department of Chemical Engineering, University of Connecticut, Storrs, CT, 06269, USA). J. Appl. Polym. Sci., 70(1), 121-127 (English) 1998. CODEN: JAPNAB. ISSN: 0021-8995. Publisher: John Wiley & Sons, Inc..
- AB An attempt to modify **membranes** for direct methanol **fuel cells** by blending Nafion with a vinylidene fluoride-hexafluoropropylene copolymer (VDF-HFP copolymer) from their solns. is reported. The purpose of this work was to reduce the methanol transport while still retaining the essential **proton cond.** in a water-contg. environment. The apparent cond., methanol barrier property, and equil. contact angle as a function of the **membrane** comps. are discussed. The blend **membranes** were also investigated using X-ray diffraction (XRD) and differential scanning calorimetry (DSC). Compared with the pure Nafion **membrane**, the Nafion/VDF-HFP copolymer blend **membrane** with 62.5 vol % of the VDF-HFP copolymer shows a decrease in the apparent cond. by about 2 orders of magnitude, and the methanol barrier properties increase substantially when only 25 vol % of the VDF-HFP-copolymer is incorporated. The equil. contact angles of water drops on the Nafion/VDF-HFP copolymer blend **membranes** as a function of the VDF-HFP copolymer content are rather similar to the plot of the advancing angle vs. the percentage of the lower-surface-energy phase. X-ray diffraction studies indicate that these two polymers crystallize sep. when blended and **cast** from their solns., and the crystn. behavior is equiv. to that of the unblended state. DSC reveals that when the VDF-HFP copolymer is mixed with Nafion in their soln. forms, an interdiffusion or other interaction takes place at the interfaces between their noncryst. regions.
- CC 37-5 (Plastics Manufacture and Processing)

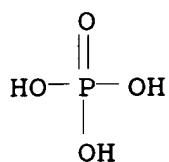
- Section cross-reference(s): 38
- ST perfluorosulfonate ionomer blend fluoropolymer **membrane**;
Nafion vinylidene fluoride hexafluoropropylene copolymer blend
- IT Ionomers
(fluoropolymers; study of blend **membranes** consisting of
nafion.RTM. and vinylidene fluoride-hexafluoropropylene
copolymer)
- IT Fluoropolymers, properties
(ionomers; study of blend **membranes** consisting of
nafion.RTM. and vinylidene fluoride-hexafluoropropylene
copolymer)
- IT Contact angle
Crystallinity
Diffusion
Electric conductivity
(study of blend **membranes** consisting of nafion.RTM. and
vinylidene fluoride-hexafluoropropylene copolymer)
- IT Fluoropolymers, properties
Polymer blends
(study of blend **membranes** consisting of nafion.RTM. and
vinylidene fluoride-hexafluoropropylene copolymer)
- IT 9011-17-0, Vinylidene fluoride-hexafluoropropylene copolymer
(study of blend **membranes** consisting of nafion.RTM. and
vinylidene fluoride-hexafluoropropylene copolymer)
- IT 67-56-1, Methanol, processes
(study of blend **membranes** consisting of nafion.RTM. and
vinylidene fluoride-hexafluoropropylene copolymer)

L92 ANSWER 7 OF 17 HCA COPYRIGHT 2000 ACS

127:334146 **Proton-conducting** polymer electrolytes
prepared by direct acid **casting**. Savinell, Robert F.;
Litt, Morton H. (Case Western Reserve University, USA). PCT Int.
Appl. WO 9737396 A1 19971009, 22 pp. DESIGNATED STATES: W: AL, AU,
BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, HU, IL, IS, JP, KP, KR, LC,
LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT,
UA, UZ, VN, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ,
CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC,
ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2.
APPLICATION: WO 1997-US5432 19970401. PRIORITY: US 1996-627769
19960401.

- AB Solid polymer electrolyte **membranes** are obtained by prepg.
a soln. of the polymer dissolved in an acid solvent contg. a doping
acid, **casting** the soln. to produce a **membrane**,
and drying the **cast membrane**. A solid polymer
electrolyte **membrane** exhibiting enhanced cond. in MeOH/air
fuel cell is prepd. by **casting** the
polymer from a soln. of HO₂CCF₃/H₃PO₄ contg. .gtoreq.300
mol% polymer.
- IT 7664-38-2, Phosphoric acid, uses
(**proton-conducting** polymer electrolytes
prepd. by direct **casting** from soln. of trifluoroacetic
acid and)

RN 7664-38-2 HCA
 CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM H01M008-02
 ICS H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38
 ST acid **casting** **proton conducting** polymer
 electrolyte; trifluoroacetic acid conducting polymer electrolyte
casting; phosphoric acid conducting polymer electrolyte
casting; methanol air fuel cell polymer
 electrolyte
 IT Electric conductivity
 (of polybenzimidazole electrolytes prepd. by direct acid
casting)
 IT Fuel cell electrolytes
 (proton-conducting polymer electrolytes
 prepd. by direct acid **casting**)
 IT Polybenzimidazoles
 (proton-conducting polymer electrolytes
 prepd. by direct **casting** from trifluoroacetic
 acid/phosphoric acid soln.)
 IT 76-05-1, Trifluoroacetic acid, uses
 (proton-conducting polymer electrolytes
 prepd. by direct **casting** from soln. of phosphoric acid
 and)
 IT 376-73-8, Hexafluoroglutaric acid 2892-51-5, Squaric acid
 (proton-conducting polymer electrolytes
 prepd. by direct **casting** from soln. of phosphoric acid
 and trifluoroacetic acid and)
 IT 7664-38-2, Phosphoric acid, uses
 (proton-conducting polymer electrolytes
 prepd. by direct **casting** from soln. of trifluoroacetic
 acid and)
 L92 ANSWER 8 OF 17 HCA- COPYRIGHT 2000 ACS
 127:102306 Ceramic membranes - potential uses for solid state
protonic conductors. Zhu, Bin; Rundgren, Kent;
 Mellander, Bengt-Erik (Department of Materials Science, Angstroem
 Laboratory, Box 534, S-751 21, Uppsala, Swed.). Solid State Ionics,
 97(1-4), 385-391 (English) 1997. CODEN: SSIOD3. ISSN: 0167-2738.
 Publisher: Elsevier.
 AB Using different wet-ceramic processes and ceramic m mbran
 technol. various thin or thick ceramic m mbran materials

were prep'd. The thin film ceramic **membran s**, prep'd. using the gel-soln. process, have different material characteristics compared with the bulk materials, for example, higher ionic cond. in the film plane than in the perpendicular direction. A very sensitive humidity dependence of the cond. has been obsd. in the thin film ceramic **membranes**. Therefore, these **membrane** materials have a potential use for constructing new types of **proton conducting** electrolyte **fuel cells** and **hydrogen** or humidity sensors.

CC 76-2 (Electric Phenomena)

Section cross-reference(s): 57

ST ceramic **membrane proton conductor**

IT Ionic conductors

Sol-gel processing

Tape casting

(ceramic **membranes**, potential uses for solid state **protonic conductors**)

IT Ceramic **membranes**

(for solid state **protonic conductors**)

IT 1344-28-1, Alumina, properties 7631-86-9, Silica, properties 10377-48-7, Lithium sulfate

(ceramic **membranes**, potential uses for solid state **protonic conductors**)

L92 ANSWER 9 OF 17 HCA COPYRIGHT 2000 ACS

123:261674 ~~New hydrocarbon~~ proton exchange **membranes** based on sulfonated styrene-ethylene/butylene-styrene triblock copolymers. Wnek, Gary E.; Rider, Jeffrey N.; Serpico, Joseph M.; Einset, Alison G.; Ehrenberg, Scott G.; Raboin, Louis A. (Dep. Chem. Cent. Polymer Synthesis, Rensselaer Polytechnic Inst., Troy, NY, 12180-3590, USA). Proc. - Electrochem. Soc., 95-23 (Proton Conducting Membrane Fuel Cells I), 247-51 (English) 1995. CODEN: PESODO. ISSN: 0161-6374.

AB Com. available styrene-ethylene/butylene-styrene triblock polymer (Kraton G1650) was partially sulfonated using a SO₃/triethyl phosphate reagent in a dichloroethane/cyclohexane mixed solvent. Films of the product were **cast** from lower alcs. to give elastic materials with different degrees of sulfonation (ca. 30-60%) as det'd. by titrn. TEM suggests that the **cast** films possess cylindrical sulfonated polystyrene domains. The films swell in water, with the extent of swelling being dependent on the sulfonation level. Ionic conductivities as high as 8.5 .times. 10⁻² S/cm are obtained when fully hydrated, and compare favorably to those exhibited by hydrated, sulfonated fluoropolymers such as Nafion.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 39

ST sulfonated triblock copolymer proton exchange **m mbrane**;
fuel cell proton exchange **membrane**
copolymer; styrene ethylene butylene triblock copolymer
m mbrane; Kraton G1650 sulfonated proton exchange

membran

- IT Electric conductivity and **conduction**
Fuel-cell electrolytes
(new hydrocarbon **proton** exchange **membranes**
based on styrene-ethylene/butylene-styrene triblock copolymers)
- IT Rubber, butadiene-styrene, preparation
(hydrogenated, block, reaction products, partially sulfonated;
new hydrocarbon proton exchange **membranes** based on)
- IT 106107-54-4P
(rubber, hydrogenated, block, reaction products, partially
sulfonated; new hydrocarbon proton exchange **membranes**
based on)
- L92 ANSWER 10 OF 17 HCA COPYRIGHT 2000 ACS
122:218566 High performance polymer electrolyte fuel
cells. Okuyama, Kazuo; Suzuki, Yoshio (Asahi Chemical Ind,
Japan). Jpn. Kokai Tokkyo Koho JP 06295729 A2 19941021 Heisei, 8
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-13550
19940207. PRIORITY: JP 1993-21297 19930209.
- AB The **fuel cells** have ion exchanger electrolyte
membranes in contact with gas diffusion electrodes having a
molded catalyst layer, which contains a catalyst laden
conductive material 0.400-0.995, a hydrophobic agent 0-0.55, and a
proton conductive material 0.005-0.080 wt. parts.
- IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST polymer electrolyte **fuel cell** electrode;
fuel cell electrode catalyst layer; **proton**
conductor fuel cell electrode
- IT Carbon black, uses
(electrode catalyst layers contg. **proton**
conductive materials for high performance polymer
electrolyte **fuel cells**)
- IT Sulfonic acids, uses
(alkane, perfluorinated, Aciplex; electrode catalyst layers
contg. **proton conductive** materials for high
performance polymer electrolyte **fuel cells**)
- IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, electrode catalyst layers
contg. **proton conductive** materials for high
performance polymer electrolyte **fuel cells**)
- IT Electrodes
(**fuel-cell**, electrode catalyst layers contg.
proton conductive materials for high
performance polymer electrolyte **fuel cells**)
- IT Fluoropolymers
(polyoxyalkylene-, sulfo-contg., ionomers, electrode catalyst
layers contg. **proton conductive** materials for
high performance polymer electrolyte **fu l cells**
)
- IT Ionomers

(polyoxyalkylenes, fluorine- and sulfo-contg., electrode catalyst layers contg. **proton conductiv** materials for high performance polymer electrolyte **fuel cells**)

IT 7440-06-4, Platinum, uses
(electrode catalyst layers contg. **proton conductive** materials for high performance polymer electrolyte **fuel cells**)

L92 ANSWER 11 OF 17 HCA COPYRIGHT 2000 ACS

121:234664 Electrode **membranes** containing polymeric ion exchange materials for **fuel cells**. Ledjeff, Konstantin; Nolte, Roland; Bauer, Michael; Mahlendorf, Falko; Peinecke, Volker (Fraunhofer-Gesellschaft Zur Foerderung der Forschung e.V., Germany). Ger. DE 4241150 C1 19940601, 16 pp. (German). CODEN: GWXXAW. APPLICATION: DE 1992-4241150 19921207.

AB The electrode **membranes** comprise a polymeric ion exchange material contacted with electrodes on both sides, where the polymeric material is formed from, e.g., substituted polydienes, polyalkenes, polyphenyleneoxides, polyphenylenesulfides, polyesters, polycarbonates, polyurethanes.

IC ICM H01M004-94

ICS C25B011-20; B01J047-12; C25B013-08; C25B009-00

ICA C08J005-22

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** electrode **membrane** composite

IT Group VIII elements

Phosphazene polymers

Polyamides, uses

Polybenzimidazoles

Polybenzoxazoles

Polycarbonates, uses

Polyesters, uses

Polyoxyphenylenes

Polysulfones, uses

Polythiophenylenes

Polyureas

Siloxanes and Silicones, uses

Urethane polymers, uses

(electrode **membranes** contg. polymeric ion exchange materials for **fuel cells**)

IT **Membranes**

(**fuel-cell** electrode, composite; electrode **membranes** contg. polymeric ion exchange materials for **fuel cells**)

IT Polymers, uses

(polydithiazoles; electrode **membranes** contg. polymeric ion exchange materials for **fuel cells**)

IT Electrodes

(**fu l-cell**, m mbranes, composite; electrode **membranes** contg. polymeric ion exchange materials for **fuel cells**)

- IT Polymers, uses
(polybenzothiazoles, electrode membran s contg.
polymeric ion exchange materials for fuel c lls
)
- IT Polyketones
Polysulfones, uses
(polyether-, electrode membranes contg. polymeric ion
exchange materials for fuel cells)
- IT Polyethers, uses
(polyketone-, electrode membranes contg. polymeric ion
exchange materials for fuel cells)
- IT Alkadienes
Alkenes, uses
(polymers, electrode membranes contg. polymeric ion
exchange materials for fuel cells)
- IT Polyquinoxalines
(polyphenylquinoxalines, electrode membranes contg.
polymeric ion exchange materials for fuel cells
)
- IT Polymers, uses
(polysulfonates, electrode membranes contg. polymeric
ion exchange materials for fuel cells)
- IT Polyethers, uses
(polysulfone-, electrode membranes contg. polymeric ion
exchange materials for fuel cells)
- IT 78-67-1, Azobis(isobutyronitrile) 10195-67-2, 4,4'-
Oxybis(benzenesulfonylsemicarbazide)
(solvent; electrode membranes contg. polymeric ion
exchange materials for fuel cells)
- L92 ANSWER 12 OF 17 HCA COPYRIGHT 2000 ACS
70:88643 Plating permselective membrane. Bartrum, Basil E.
(Dow Chemical Co.). Brit. GB 1143883 19690226, 9 pp. (English).
CODEN: BRXXAA. APPLICATION: GB 19670623.
- AB An electroconductive coating layer is deposited on a surface of a
permselective membrane by contact of a metallic compd.
with a reducing agent in contact with the surface to be coated. The
metallic component and the reducing agent are brought into contact
with opposite surfaces of the membrane. The coated
membranes are useful in the manuf. of fuel
cells in which elec. current is generated by the energy
given off by a controlled chem. reaction. Thus, hollow, permeable
polyethylene fiber (outside diam. 190 .mu., inside diam. 120 .mu.)
produced by melt spinning was chlorosulfonated with 10% ClSO₃H, the
fiber hydrolyzed, washed with H₂O, and cast into a bundle
by sealing its ends by using an epoxy resin compn. contg. the
diglycidyl ether of bisphenol 14.7, N-(soya alkyl)-1,3-
propylenediamine 6.8, and di-methylaminopropylamine 1.1 parts. On
the outside of the fibers was placed a soln. consisting of 3.5 parts
AgNO₃ in 3.0 parts H₂O with enough NH₄OH to dissolve the ppt.
initially formed. Through the interior of the fibers was passed a
continuous stream of a soln. prepd. by addn. of 0.166 part Rochelle

salt (K Na tartrate) to a boiling soln. of 0.2 part AgNO₃ in 100 parts H₂O, boiling 5 min., and filtration of the soln. The plating operation was continued 1 hr. to give the inside of the fibers a good adherent coating of Ag. Other reducing agents used were PhNHNH₂, Na hypophosphite, Na₂S₂O₄, NH₂NH₂.H₂SO₄, or H₂NNH₂.H₂O. Other metallic salts used were NiSO₄, copper oxide, H₂PtCl₆.6H₂O, and HAuCl₄.

IC C23C

CC 37 (Plastics Fabrication and Uses)

ST metalplating permselective **membranes**; permselective **membranes** metalplating; **fuel cell membranes**; chlorosulfonated polyethylene fibers plating; polyethylene chlorosulfonated fibers plating; silver plating polyethylene **membranes**; nickel plating polyethylene **membranes**; copper plating polyethylene **membranes**; gold plating polyethylene **membranes**

IT Resins, epoxy, uses and miscellaneous
(cation-exchanging **membranes** from sulfonated ethylene polymer fibers and, metal plating on)

IT **Membranes**
(cation-exchanging, plating on, with metals)

IT Fiber, synthetic
(ethylene polymers, sulfonated, cation-exchanging **membranes** from, metal plating on)

IT **Fuel cells**
(**membranes** for, metal plating on)

IT Cation exchangers, uses and miscellaneous
(**membranes**, metal plating on)

IT Coating materials
(metals, on cation-exchanging **membranes**)

IT 7440-22-4, uses and miscellaneous
(coatings of, on cation-exchanging **membranes**)

IT 9002-88-4, uses and miscellaneous
(sulfonated, fibers, cation-exchanging **membranes** from, metal plating on)

L92 ANSWER 13 OF 17 HCA COPYRIGHT 2000 ACS

70:5042 Porous, extensively fibrillated poly(tetrafluoroethylene). Landi, Henry P. (American Cyanamid Co.). U.S. US 3407249 19681022, 5 pp. (English). CODEN: USXXAM. APPLICATION: US 19650629 19660228.

AB Poly(tetrafluoroethylene) (I) aq. dispersions are hot milled with 40-98% poly(Me methacrylate) (II) at 170-200.degree. and compression molded into sheets that are then solvent extd. to remove II and leave wettable, unsintered, porous, and completely fibrillated I films useful as electrolyte matrixes in **fuel cells**. For example, a 4:1 blend (based on solids) of II and an aq. dispersion contg. 59-61 wt. % I and 5.5-6.5 wt. % polyethylene glycol octylphenol ether (wetting agent) was milled on preheated rolls at 70-5.degree.. I particles formed interwoven fibers. The blend was injection molded into plaques, which were compression molded for 5-10 min. at 160-70.degree./300

psig. The resulting film (10-20 mils) was soaked in acetone to remove II, rinsed in alc. and H₂O, and dried to give a fibrillated I sheet. The sheet was soaked several hrs. in 85% H₃PO₄ contg. 0.1% NH₄ perfluorocaprylate at 100-10.degree., cooled in the electrolyte, and incorporated between the electrodes of a H-O fuel cell. Improvement of fuel-cell performance was obtained with sheets contg. 5-75 wt. % nonelectron-conducting org. filler, e.g. poly-(chlorotrifluoroethylene), CeO₂, BaSO₄, or SnHPO₄.

NCL 264049000

CC 37 (Plastics Fabrication and Uses)

ST polytetrafluoroethylene sheets; fuel cell matrixes; matrixes fuel cell; desalination membranes; membranes desalination

IT Membranes

(fuel-cell, from fibrillated porous tetrafluoroethylene polymers)

IT Fuel cells

(membranes for, from fibrillated porous tetrafluoroethylene polymers)

IT 9002-84-0, uses and miscellaneous

(cellular, fibrillated membranes, for fuel cells)

IT 9011-14-7, uses and miscellaneous

(extn. from tetrafluoroethylene polymers contg., for fuel-cell membrane manuf.)

L92 ANSWER 14 OF 17 HCA COPYRIGHT 2000 ACS

68:3603 Coating permeable membranes with electrically conducting metallic films, especially the inside of hollow fiber membranes. Levine, Charles Arthur; Prevost, Alfred L. (Dow Chemical Co.). U.S. US 3351487 19671107, 10 pp. (English). CODEN: USXXAM. APPLICATION: US 19631106.

AB Permeable membranes are plated with an elec.-conducting metallic film by contact of 1 side of the membrane with a metal-ion soln. and the other side with a reducing agent. With cationic membranes, the metal ions permeate the membrane and are uniformly deposited on the surface in contact with the reducing agent. With anionic membranes, the reducing agent permeates to cause metal deposition. The membranes, which are films or hollow fibers, are uniformly plated with reduced waste and are useful in fuel cells. Thus, polyethylene hollow fibers (120 .mu. inside diam.) were chlorosulfonated with 10% ClSO₂OH, hydrolyzed, and washed to give an ion-exchange capacity of 1.5 meq./g. The ends of a treated fiber bundle were potted in epoxy resin and the cast resin was machined to expose the open fibers. The encapsulated fiber ends were mounted in an app. that pumped a reducing soln. through the side of the fibers, while their exteriors were immersed in a plating soln. contg. 3.5 parts AgNO₃, 3 parts H₂O, and sufficient NH₄OH to dissolve initial ppt. The reducing soln. contained PhNHNH 1, EtOH 11, and H₂O 10 parts. After 1.5

hrs., the fiber interiors were plated with an adherent Ag film that did not clog the **membran** pores and had a resistance of 15 ohms./cm. The exterior surface resistance was 5000 ohms/cm. Similar conducting **membranes** were prepd. by plating Ni, Cu, Pt, Pd, and Au on film or fiber **membranes** of Nalfilm I and II, sulfonated nylon (Accropore 5A 6404 Resin), and 3:7 polyethylene-zeolite mixts. Rochelle salt, a NaOH-HaSH.2H2O-NaH2PO2.H2O mixt., Na2S2O4, a KOH-N2H4.H2SO4-N2H4.H2O mixt., and N2H4.H2O were used as reducing agents.

NCL 117227000

CC 37 (Plastics Fabrication and Uses)

ST COPPER LINING PLASTIC FIBERS; GOLD LINING PLASTIC FIBERS; **FUEL CELL FIBER MEMBRANES**; NICKEL LINING PLASTIC FIBERS; SILVER LINING POLYETHYLENE FIBERS; METAL COATING PERMEABLE FIBERS; FIBERS PERMEABLE METAL COATING; PLATINUM LINING PLASTIC FIBERS; PERMEABLE FIBERS METAL COATING; PALLADIUM LINING PLASTIC FIBERS; POLYETHYLENE FIBERS METAL LINING

IT **Membranes**

(**fuel-cell**, from hollow fibers lined with electrically conducting films)

IT Fiber, synthetic

(hollow, lined with electrically conducting metallic films, for **membranes for fuel cells**)

IT **Fuel cells**

(**membrane** for, with hollow fibers, lined with electrically conducting films)

IT Anion exchangers, uses and miscellaneous

(**membranes**, and hollow fibers therefrom, coated with electrically conducting metallic films, for **fuel cells**)

IT Cation exchangers, uses and miscellaneous

(sulfonated, **membranes** from hollow fibers of, lined with electrically conducting films, for **fuel cells**)

IT Nylon, uses and miscellaneous

(sulfonated, permeable **membranes** from, coated with electrically conducting metallic films, for **fuel cells**)

IT 7440-02-0, uses and miscellaneous 7440-05-3, uses and miscellaneous 7440-06-4, uses and miscellaneous 7440-22-4, uses and miscellaneous 7440-50-8, uses and miscellaneous 7440-57-5, uses and miscellaneous

(coatings and linings of, on **membranes** and hollow fibers, for **fuel cells**)

IT 9002-88-4, uses and miscellaneous

(sulfonated, **membranes** from hollow fibers of, lined with electrically conducting films, for **fuel cells**)

L92 ANSWER 15 OF 17 HCA COPYRIGHT 2000 ACS

68:3536 Internally plast~~ic~~ized cation-exchange resins. Aftergut, Siegfried (General Electric Co.). U.S. US 3350327 19671031, 3 pp.

(English). CODEN: USXXAM. APPLICATION: US 19640326.

AB The title resin having increased flexibility and a lower shrinkage factor on dehydration are prepd. by reaction of an alkaryl polyether, $\text{PhO}[(\text{CH}_2)_n\text{O}]_x\text{Ph}$, with concd. H_2SO_4 , oleum, or chlorosulfonic acid, treating the sulfonated deriv. with an aldehyde-releasing compd. to polymerize and crosslink it, and curing for 1-2 hrs. at 85-95.degree.. The cationic ion-exchange resins and **membranes** are used as electrolytes in **fuel cells**, as **membranes** in electrodialysis cells, in the desalination of water, in purification of radioactive wastes, in desalination of sugar juices, preparative org. chemistry, and ion-exchange and purification processes. Thus, 1 mole 1,2-diphenoxyethane and 2 moles concd. H_2SO_4 were heated for 2 hrs. at 145.degree., 20 g. of the resulting 1,2-diphenoxyethanedisulfonic acid treated with 8 g. 37% HCHO , and the mixt. cast between 2 glass plates and heated for 2 hrs at 90.degree. to give a **membrane** having an ion-exchange capacity of 2.9 meq./dry g. and sp. resistivity of the fully hydrated **membrane** 7.5 ohm-cm. A resin having even greater flexibility was prepd. by using a monomer having a dimeric oxyethylene bridge between the terminal Ph groups, i.e. $(\text{PhOCH}_2\text{CH}_2)_2\text{O}$.

NCL 260002200

CC 36 (Plastics Manufacture and Processing)

ST CATION EXCHANGE RESINS PLASTICIZED; ACID; RESINS CATION EXCHANGE PLASTICIZED; **MEMBRANES** ELECTRODIALYSIS CELLS; **FUEL CELL** ELECTROLYTES; WATER DESALINATION **MEMBRANES**; RADIOACTIVE WASTE PURIFN; ELECTRODIALYSIS CELLS **MEMBRANES**; SUGAR JUICE DESALINATION; PLASTICIZED CATION EXCHANGE RESINS; DESALINATION **MEMBRANES**; ALKARYL POLYETHERS VS SULFURIC

IT **Membranes**

(cation-exchanging, from sulfonated aralkyl polyether polymers with formaldehyde)

IT Cation exchangers, preparation

(**membranes**, from sulfonated aralkyl polyether polymers with formaldehyde)

IT Benzenesulfonic acid, (ethylenedioxy)di-, polymer with formaldehyde
Benzenesulfonic acid, [oxybis(ethyleneoxy)]di-, polymer with formaldehyde
(as cation-exchanging **membranes**)

L92 ANSWER 16 OF 17 HCA COPYRIGHT 2000 ACS

67:60365 **Fuel cell** with matrix. Hamlen, Robert Paul
(General Electric Co.). Fr. FR 1474667 19670324, 5 pp. (French).
CODEN: FRXXAK. PRIORITY: US 19650406.

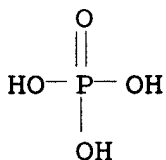
AB **H3PO4** is the main ionic conductor of the **fuel cell**. The solid ingredients are insol. compds. of Group IVB. These are mixed with water to form a gel or a mortar which is poured into a mold, and allowed to dry in the green state. Then, it is fired at 380-800.degree. to form a matrix, which is impregnated with **H3PO4**. Polymd. fluorocarbons are generally added as a constituent of the matrix to increase the

resilience. In this case, a metallic oxide of Group IV B is treated with an excess of H_3PO_4 , and the polymd. fluorocarbon is added while mixing as a colloidal aq. dispersion or powder. An efficient method consists in cooling the mixt. at the liquid N temp., then crushing, spreading the powder, pressing for 2 min. when cold under 1400 kg./cm.², and then under 105 kg./cm.² at 350.degree.. When a group other than H_3PO_4 is desired, an oxide of a Group IVB metal is treated with arsenate, tungstate, silicate, or molybdate in their acid state. The porosity can be increased by incorporation of a sol. salt (NaCl) which is then dissolved out. The voids are filled with H_3PO_4 . The proportion of H_3PO_4 is 10-90%. Conventional electrocatalysts are used. They are bound to the electrolytic part, with a metallic current collector, by pressing at 1.75-21 kg./cm.² and ambient temp. to 350.degree.. Thus, a mixt. contg. H_3PO_4 (sp. gr. 1.87) 65%, ZrO_2 23, poly(tetrafluoroethylene) (PTFE) 21% (the rest water) is allowed to dry at 150.degree. for 16 hrs. The rubber-like residue is cooled with liquid N_2 and crushed. The powder is spread on the plate of a press (50 mm.) and pressed at 9000 kg. for 2 min. at ambient temp., into a 1-mm. thick plate. Black Pd (85% by wt.) is mixed with PTFE (15%), then spread between 2 Al sheets, pressed at 45 kg. and 350.degree.. Al is dissolved in H_3PO_4 , and both membrane and electrode are set into a fuel cell. Pt wire netting is used as a current collector, in contact with the electrode. The specific resistance of the cell at 150.degree. was 27 ohm-cm. With H_2 and O_2 as fuels, the potential at open circuit was 0.67v., and 0.32v. for 60 ma./cm.² at 150.degree..

IT 7664-38-2, uses and miscellaneous
(impregnation by, of zirconium oxide (ZrO_2) matrix for fuel cells)

RN 7664-38-2 HCA

CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IC H01M

CC 77 (Electrochemistry)

ST FUEL CELL MATRIX; MATRIX FUEL CELL

IT Fuel cells
(with matrix of zirconium oxide (ZrO_2) bonded with tetrafluoroethylene polymers and impregnated with phosphoric acid)

IT 9002-84-0, uses and miscellaneous
(fu 1-c 11 matrix of zirconium oxide (ZrO_2))

- impregnated with phosphoric acid and bonded with)
- IT 1314-23-4, uses and miscellaneous
(**fuel-c ll** matrix, bonded with
tetrafluoroethylene polymers and impregnated with phosphoric
acid)
- IT 7664-38-2, uses and miscellaneous
(impregnation by, of zirconium oxide (ZrO₂) matrix for
fuel cells)
- L92 ANSWER 17 OF 17 HCA COPYRIGHT 2000 ACS
66:3379 **Molded** electrodes. Langer, Stanley H.; Landi, Henry
P. (American Cyanamid Co.). U.S. US 3282738 19661101, 4 pp.
(English). CODEN: USXXAM. APPLICATION: US 19630228.
- AB A process is described for making **molded** catalytic
electrodes useful in **fuel cells** such as
H-O contg. gas **fuel cells**. Thus, a
mixt. of Pt black 91 and 10% aq. polyethylene 9 parts contg.
nonylphenol-ethylene oxide emulsifier was spread over a stainless
steel wire cloth held on a sheet of plate glass. The cloth was
transferred to blotter paper for initial drying. From the material
which passes through the cloth onto the glass plate was used the
final surfacing of the electrode sheet. The sheet was placed on a
fresh blotter and dried in a desiccator. The sheet was pressed 10
min. at 85.degree./300 psi. An electrode was cut from the sheet and
tested as a H and O electrode against standard Pt black electrodes
in an exptl. **fuel cell** contg. a **membrane**
consisting of filter paper satd. with 2N H₂SO₄. At
current d. 74 ma./cm.², the voltage recorded was 0.7 v. as a H
electrode and 36 ma./cm.² as an O electrode. A mixt. of Pt and Cr
acetylacetonate can also be used as a catalyst.
- NCL 136120000
CC 37 (Plastics Fabrication and Uses)
ST POLYETHYLENE **MOLDED** ELECTRODES; ELECTRODES **MOLDED**
POLYETHYLENE
- IT **Fuel cells**
(electrodes for, from platinum black with ethylene polymer
binders)
- IT Electrodes
(from platinum black with ethylene polymer binder, for
fuel cells)
- IT 2,4-Pentanedione, chromium complex
(electrodes (catalytic) from platinum black and, for **fuel**
cells)
- IT 7440-06-4, uses and miscellaneous
(black, electrodes for **fuel cells** from)
- IT 13681-82-8
(electrodes (catalytic) from platinum black and, for **fuel**
cells)
- IT 9002-88-4, uses and miscellaneous
(electrodes for **fu l c lls** from platinum
black and)
- IT 7782-44-7, uses and miscellaneous

(fuel cells, with hydrogen,
platinum black electrodes contg. ethylene polymers for)
IT 1333-74-0, uses and miscellaneous
(fuel cells, with oxygen, platinum black
electrodes contg. ethylene polymers for)

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L95 ANSWER 1 OF 7 HCA COPYRIGHT 2000 ACS

130:260528 Polymer-based ionic conductor material. Gandon, Christophe;
Fix, Renaud (Saint Gobain Vitrage S.A., Fr.). Fr. Demande FR
2767743 A1 19990305, 31 pp. (French). CODEN: FRXXBL. APPLICATION:
FR 1997-10973 19970903.

AB The invention concerns a polymer-based ionic conductor layer on
which is assocd. .gtoreq.1 peelable film. The invention equally
concerns the process of fabrication of this material, notably by
extrusion or by coating, and the process of fabrication of
electrochem. devices comprising this material. Claimed polymers
include thermoplastics, elastomers, thermocrosslinkable in the form
of a gel, more specifically polyoxyalkylenes of type POE, POP, PEI,
BPRI, polyvinylpyrrolidone, polyamides or acrylates, PVA,
polyethylene succinate, polymethylene sulfide, polyethylene adipate,
poly-.beta.-propiolactone, **polyphosphazene**,
polyacrylonitrile, poly(divinylidene fluoride), polyvinylbutyral,
polystyrene, polybutadiene, PMMA, cellulose acetate,
polyfluorocarbons, poly(ethyloxazoline), poly(iso-
butylmethacrylate), poly-tert-butylmethacrylate, polyenaminonitrile,
poly-4-vinylpyridine, phenylene polysulfide sulfonic acid,
polyether-ether ketones poly-p-phenylene, polyphenylene sulfide,
these last 3 polymers able to be or not to be sulfonates,
polyphosphonate esters such as polydimethylphenylene oxide
phosphonate and sulfonated polysulfones. Claimed application
include use in electrochem. devices, battery energy storage,
fuel cells, gas sensors, electrochromic
glazing/glasses, and retro-viewfinders.

IC ICM B32B007-06

ICS B32B027-06; B32B031-30; C03C017-32; B29C047-02; H01M002-16

CC 76-2 (Electric Phenomena)

Section cross-reference(s): 36, 52, 72

ST polymer based ionic conductor; electrochem device polymer based
ionic conductor; battery polymer based ionic conductor; **fuel**
cell polymer based ionic conductor; gas sensor polymer based
ionic conductor; glazing electrochromic polymer based ionic
conductor; glass electrochromic polymer based ionic conductor; retro
viewfinder polymer based ionic conductor

IT Antioxidants

Coating process

Conducting polymers

Electrochromic materials

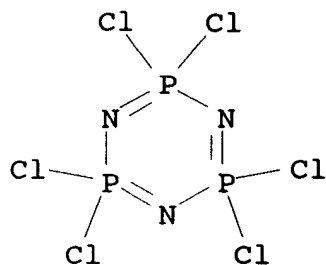
Electrolytes
Extrusion of polymeric materials
Fu l c lls
Fungicides
Gas sensors
Lubricants
Plasticizers
Primary batteries
Secondary batteries
Surfactants
Thixotropic agents
 (polymer-based ionic conductor material)
IT Acrylic polymers, processes
Fluoropolymers, processes
Phosphazenes
Polyamides, processes
Polycarbonates, processes
Polyesters, processes
Polyolefins
Polyoxyalkylenes, processes
Polysiloxanes, processes
Polythiophenylenes
Polyvinyl butyrals
Sulfonates
Synthetic rubber, processes
Thermoplastics
 (polymer-based ionic conductor material)

L95 ANSWER 2 OF 7 HCA COPYRIGHT 2000 ACS
130:84063 Gas-diffusion electrodes using **polyphosphazenes** for
fuel cells. Saito, Akira (Japan Storage Battery
Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11003715 A2 19990106
Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
1997-168131 19970609.
AB The title electrodes comprise **polyphosphazenes** as
water-repellent agents. The electrodes are obtained by simple
process without using surfactants.
IT **25231-98-5D**, Hexachlorocyclotriphosphazene homopolymer,
alkoxy group-contg. **26085-02-9D**,
Poly(dichlorophosphazene), alkoxy group-contg.
 (gas-diffusion electrodes using **polyphosphazene**
 water-repellent agents for **fuel cells**)
RN 25231-98-5 HCA
CN 1,3,5,2,4,6-Triazatriphosphorine, 2,2,4,4,6,6-hexachloro-2,2,4,4,6,6-
hexahydro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

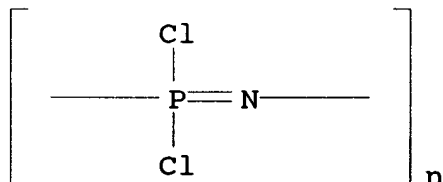
CRN 940-71-6

CMF C16 N3 P3



RN 26085-02-9 HCA

CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



IC ICM H01M004-86

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **polyphosphazene** water repellent fuel
cell electrode; gas diffusion electrode
polyphosphazene

IT **Polyphosphazenes**
(amino; gas-diffusion electrodes using **polyphosphazene**
water-repellent agents for **fuel cells**)

IT **Polyphosphazenes**
(fiber, fluorine and ethoxy-contg.; gas-diffusion electrodes
using **polyphosphazene** water-repellent agents for
fuel cells)

IT **Polyphosphazenes**
(fluorine-contg., alkoxy-contg.; gas-diffusion electrodes using
polyphosphazene water-repellent agents for **fuel**
cells)

IT **Fuel cell electrodes**
(gas-diffusion electrodes using **polyphosphazene**
water-repellent agents for **fuel cells**)

IT **Polyphosphazenes**
(methoxy; gas-diffusion electrodes using **polyphosphazene**
water-repellent agents for **fuel cells**)

IT Fluoropolymers, uses
(**polyphosphazene**-, alkoxy-contg.; gas-diffusion
electrodes using **polyphosphazene** water-repellent agents
for **fuel cells**)

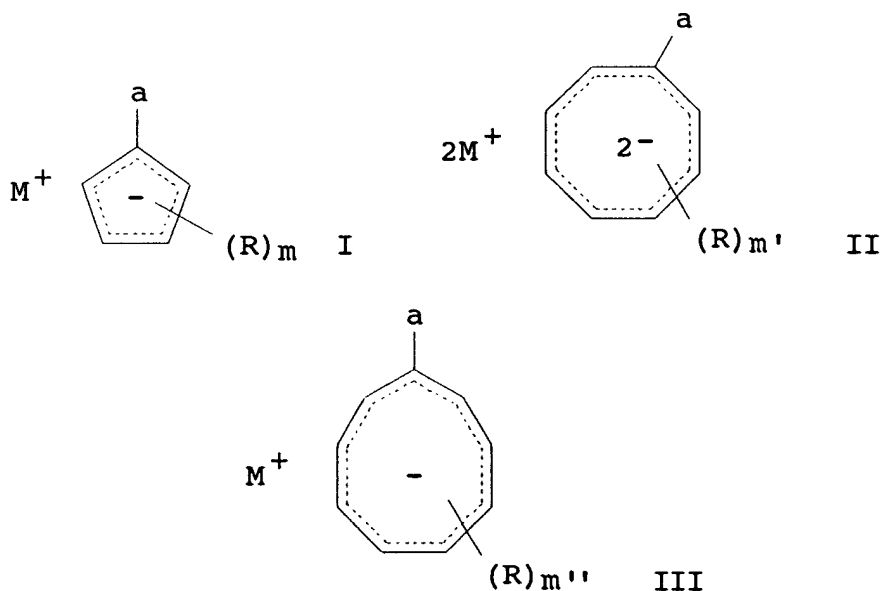
IT Synthetic polymeric fibers, uses
(**polyphosphazenes**, fluorine and ethoxy-contg.;
gas-diffusion electrodes using **polyphosphazene**)

water-repellent agents for fuel cells)
 IT 25231-98-5D, Hexachlorocyclotriphosphazene homopolymer,
 alkoxy group-contg. 26085-02-9D,
 Poly(dichlorophosphazene), alkoxy group-contg.
 (gas-diffusion electrodes using polyphosphazene
 water-repellent agents for fuel cells)

L95 ANSWER 3 OF 7 HCA COPYRIGHT 2000 ACS

125:119530 Ion-conductive polymers for electrochemical devices.
 Rosenmeier, Lars; Knutz, Boye Cornils (Danacell Aps, Den.). PCT
 Int. Appl. WO 9617359 A1 19960606, 42 pp. DESIGNATED STATES: W:
 AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK,
 DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK,
 LR, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU;
 AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FR, GA, GB, GR, IE,
 IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN:
 PIXXD2. APPLICATION: WO 1995-DK484 19951130. PRIORITY: DK
 1994-1370 19941201.

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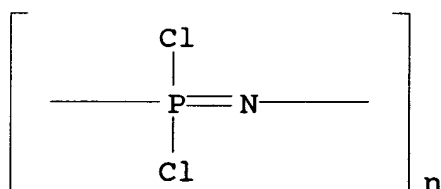
AB An ion-conductive polymer, suited for use as an electrolyte in electrochem. devices, e.g., rechargeable batteries, fuel cells, contg. covalently bound ion complexes of one of formulas I, II, or III (M⁺ is H⁺, Li⁺, Na⁺, or K⁺; m is an integer in the range 0-4; m' is an integer in the range 0-7; m'' is an integer in the range 0-8; and each R independently is halogen; -CO-O-, M⁺, or -SO₂-O-, M⁺; cyano; nitro; C1-5 alkoxy; optionally

substituted Ph or phenoxy; -CONR5R6 or -NR5R6 where R5 and R6 independently are hydrogen, C1-5 alkyl, optionally substituted Ph, phenylcarbonyl, or C1-6 alkanoyl; -N(R5)-CO-R7 where R7 is hydrogen, C1-5 alkyl, C2-5 alkenyl, C2-5 alkynyl, or optionally substituted phenyl; R7-CO-, R7-O-CO-, R7-CO-O-, or R7-O-CO-O-; cycloheptatrienyl; or a group further specified).

IT **26085-02-9D**, Poly(dichlorophosphazene), reaction products with polyethoxylated compds. and lithium cyclopentadienylide derivs. (ion-conductive polymers as electrolyte for electrochem. devices)

RN 26085-02-9 HCA

CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



IC ICM H01B001-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76

IT 9004-74-4D, reaction products with ethoxylated polysiloxanes
26085-02-9D, Poly(dichlorophosphazene), reaction products with polyethoxylated compds. and lithium cyclopentadienylide derivs.
132408-80-1D, reaction products with ethoxylated polysiloxanes
179074-70-5D, reaction products with ethoxylated polysiloxanes
179074-71-6D, reaction products with ethoxylated polysiloxanes
179074-72-7D, reaction products with ethoxylated polysiloxanes
179074-73-8D, reaction products with ethoxylated polysiloxanes
179074-74-9D, reaction products with ethoxylated polysiloxanes
179074-75-0D, reaction products with ethoxylated polysiloxanes
179074-76-1 179074-77-2 179074-79-4 179077-50-0
179238-41-6D, reaction products with lithium cyclopentadienylide complexes
(ion-conductive polymers as electrolyte for electrochem. devices)

L95 ANSWER 4 OF 7 HCA COPYRIGHT 2000 ACS

120:307378 Osteoblast culture on bioerodible polymers: studies on initial cell adhesion and spread. Laurencin, Cato T.; Morris, Carol D.; Pierre-Jacques, Henri; Schwartz, Edith R.; Keaton, Altorous R.; Zou, Ligan (Div. Health Sci. Technol., Massachusetts Inst. Technol., Cambridge, MA, USA). Polym. Adv. Technol., 3(6), 359-64 (English) 1992. CODEN: PADTE5. ISSN: 1042-7147.

AB The development of systems for the growth of osteoblasts on bioerodible polymeric matrixes was explored. Three classes of bioerodible polymers were studied as possible matrix supports for osteoblast growth: the poly(anhydrides), poly(phosphazenes) and poly(lactic acid/glycolic acid) copolymers. Neonatal calvarial cells from Sprague-Dawley rats were

seeded onto polymer disks at a d. of 1 .times. 104 cells/cm2. Initial attachment and spreading, rate of growth and morphol. were detd., and retention of osteoblast-like phenotype was assessed through measurements of alk. phosphatase activity in the presence and absence of 1,25-dihydroxyvitamin D3. All results were considered relative to tissue culture polystyrene. Cells were found to attach to all polymers at 8 h post-seeding. By 24 h, cell nos. on all polymers were found to be decreased, except for poly(lactic acid/glycolic acid). Rat calvarial osteoblasts seeded on poly(lactic acid/glycolic acid) reached confluency and retained their phenotype. Successful construction of viable osteoblast-bioerodible polymer composite materials, as presented in the authors' study, may find their usefulness as grafts for atrophic non-unions of bone, for healing craniofacial and other defects and for use as prosthetic implants or coatings. Composite systems of osteoblast cultures may also find their usefulness in furthering the authors' understanding of bone differentiation, maturation and metab. in a matrix environment.

CC 63-7 (Pharmaceuticals)

L95 ANSWER 5 OF 7 HCA COPYRIGHT 2000 ACS

93:242741 ~~Cell and fuel cell electrodes~~

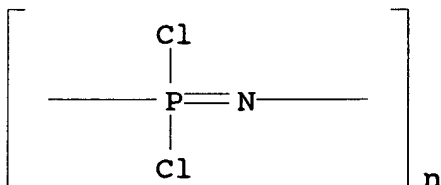
having a **poly(phosphazene)** binder. Auburn, James J. (Bell Telephone Laboratories, Inc., USA). U.S. US 4223080 19800916, 4 pp. (English). CODEN: USXXAM. APPLICATION: US 1979-38347 19790511.

AB Battery or **fuel-cell** electrodes are prepd. from an active electrode material and a **poly(phosphazene)** binder. Thus, the preps. of C, V6013, and TiS2 electrodes from mixts. contg. the resp. active electrode material and **poly[bis(trifluoroethoxy)-phosphazene]** binder are reported.

IT **26085-02-9D**, reaction products with sodium trifluoroethoxide or sodium phenate (binders, electrodes contg., battery or **fuel-cell**)

RN 26085-02-9 HCA

CN Poly[nitrilo(dichlorophosphoranylidene)] (8CI, 9CI) (CA INDEX NAME)



IC H01M006-14

NCL 429194000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 37

- ST electrode battery **polyphosphazen** binder; fu 1
cell electrode **polyphosphazene** binder; carbon
electrode **polyphosphazen** binder; vanadium oxide electrode
polyphosphazene binder; titanium disulfide electrode
polyphosphazene binder
- IT Electrodes
(battery, **fuel-cell**, contg. **poly(**
phosphazene) binder)
- IT 139-02-6D, reaction products with poly(dichlorophosphazene)
420-87-1D, reaction products with poly(dichlorophosphazene)
26085-02-9D, reaction products with sodium trifluoroethoxide
or sodium phenate
(binders, electrodes contg., battery or **fuel-**
cell)
- IT 7440-44-0, uses and miscellaneous 12037-42-2 12039-13-3
(electrodes, contg. **poly(phosphazene)** binder,
battery or fuel-cell)
- L95 ANSWER 6 OF 7 HCA COPYRIGHT 2000 ACS
90:124662 **Electrodes for fuel cell or air-metal**
batteries. Yoshida, Motoko; Ohbayashi, Hidehito; Kudo, Tetsuichi
(Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 53139143 19781205
Showa, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
1977-53059 19770511.
- AB An elec. conducting porous substrate is impregnated with a
polymer-org. solvent soln. and dried to prep. a water-repellent gas
electrode. Thus, a sintered $\text{Nd}_{0.9}\text{Sr}_{0.1}\text{CoO}_3$ was impregnated in a
[NP(OCH₂CF₃)₂]_n-THF soln. and dried. The electrode withstood >500
charge-discharge cycles in an air battery contg. a Pt electrode and
a 30% KOH electrolyte. A PTFE-impregnated electrode withstood <100
charge-discharge cycles.
- IC H01M004-88
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 37
- ST electrode **phosphazene polymer fuel**
cell
- IT **Phosphazene polymers**
(fluoroalkoxy and alkoxy, oxide electrodes impregnated with,
battery or **fuel-cell**)
- IT Electrodes
(battery, **phosphazene polymer-impregnated**
oxide)
- IT Electrodes
(**fuel-cell, phosphazene**
polymer-impregnated oxide)
- IT 53096-06-3
(electrodes, battery or **fuel-cell**,
phosphazene polymer-impregnated)
- L95 ANSWER 7 OF 7 HCA COPYRIGHT 2000 ACS
77:42467 **Electrodes comprising a fluorinated phosphonitrile polymer for**
use in **fu 1 cells**. Palmer, Nigel I. (Leesona)

Corp.). U.S. US 3660165 19720502, 6 pp. (English). CODEN: USXXAM.
APPLICATION: US 1970-30948 19700422.

AB Lightwt. electrodes were prepd. from an admixt. of catalyst and a fluorinated phosphonitrile polymer. The backing layer can be a continuous film or particulate polymer composed of hydrophobic fluorinated phosphonitrile and its derivs. or poly(tetrafluoroethylene). The electrode is adapted to be disposed in an electrochem. cell with the catalytic layer in contact with the cell electrolyte.

IT 37002-15-6
(in **fuel-cell** cathodes, with platinum catalysts)

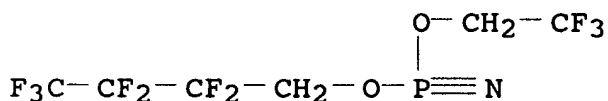
RN 37002-15-6 HCA

CN Metaphosphimic acid (H₂PO₂N), 2,2,3,3,4,4,4-heptafluorobutyl 2,2,2-trifluoroethyl ester, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 45241-25-6

CMF C6 H4 F10 N O2 P



IC H01M

NCL 136086000D

CC 77-2 (Electrochemistry)

ST fluorinated phosphonitrile polymer **fuel cell**;
PTFE **fuel cell**

IT Cathodes
(**fuel-cell**, platinum catalysts with fluorinated phosphonitrile polymer)

IT 7440-06-4, uses and miscellaneous
(catalysts, **fuel-cell**, with fluorinated phosphonitrile polymer)

IT 37002-15-6
(in **fuel-cell** cathodes, with platinum catalysts)

=> d 193 1-15 ti

L93 ANSWER 1 OF 15 HCA COPYRIGHT 2000 ACS

TI **Proton-conducting polymer membrane**
based on sulfonated polystyrene microspheres and an amphiphilic polymer blend

L93 ANSWER 2 OF 15 HCA COPYRIGHT 2000 ACS

TI FTIR study of water in **cast** Nafion films

- L93 ANSWER 3 OF 15 HCA COPYRIGHT 2000 ACS
TI Preparation of perfluorocarbon polymers containing **phosphonic acid** groups
- L93 ANSWER 4 OF 15 HCA COPYRIGHT 2000 ACS
TI Gas transport properties in copolyarylates of 4,4'-biphenyldicarboxylic **acid** with phenolphthalein and tetrabromophenolphthalein
- L93 ANSWER 5 OF 15 HCA COPYRIGHT 2000 ACS
TI Effects of **protonation** on the **transport** of hydrophobic nitrogen heterocycles through perfluorosulfonate ionomer **membranes**
- L93 ANSWER 6 OF 15 HCA COPYRIGHT 2000 ACS
TI Separation of supercritical carbon dioxide and ethanol mixtures with an asymmetric polyimide **membrane**
- L93 ANSWER 7 OF 15 HCA COPYRIGHT 2000 ACS
TI ATP-driven calcium/hydrogen ion antiport in **acid** vesicles from Dictyostelium
- L93 ANSWER 8 OF 15 HCA COPYRIGHT 2000 ACS
TI Preparation of functional polymeric **membranes** for **proton** driven ion **transport**
- L93 ANSWER 9 OF 15 HCA COPYRIGHT 2000 ACS
TI Manufacturing of **proton conductor** film having improved conductivity
- L93 ANSWER 10 OF 15 HCA COPYRIGHT 2000 ACS
TI The **membrane** potential of the cellular slime **mold** Dictyostelium discoideum is mainly generated by an electrogenic proton pump
- L93 ANSWER 11 OF 15 HCA COPYRIGHT 2000 ACS
TI Preparation of N-methoxymethylated nylon-3 and application of its **membrane** to pervaporation of water-alcohol mixture
- L93 ANSWER 12 OF 15 HCA COPYRIGHT 2000 ACS
TI Active and selective transports of alkali metal ions through the polyelectrolyte complex **membrane** consisting of methyl glycol chitosan, (carboxymethyl)dextran and poly(vinyl sulfate)
- L93 ANSWER 13 OF 15 HCA COPYRIGHT 2000 ACS
TI Development of ion-exchange **membrane** for an artificial kidney system
- L93 ANSWER 14 OF 15 HCA COPYRIGHT 2000 ACS
TI Active hydrogen exchange reaction of poly(.gamma.-methyl L-glutamate) **m mbrane** with deuterium oxide and movement of

diffusion of water in the membrane

L93 ANSWER 15 OF 15 HCA COPYRIGHT 2000 ACS
 TI Active **proton transport** across the surface
 membrane of the slime mold *Physarum polycephalum*

=> d 193 1,8,9 cbib abs hitstr hitind

L93 ANSWER 1 OF 15 HCA COPYRIGHT 2000 ACS

133:90336 **Proton-conducting polymer membrane**

based on sulfonated polystyrene microspheres and an amphiphilic polymer blend. Hong, Liang; Chen, Ningping (Department of Chemical & Environmental Engineering, National University of Singapore, Singapore, 119260, Singapore). J. Polym. Sci., Part B: Polym. Phys., 38(11), 1530-1538 (English) 2000. CODEN: JPBPEM. ISSN: 0887-6266. Publisher: John Wiley & Sons, Inc..

AB A new type of amphiphilic polymer blend comprising polystyrene (PS), polyethylene oxide (PEO) and microspheres of crosslinked polystyrene sulfonic acid (PSSA) was prep'd. by soln. blending and followed by casting. Besides providing protons, PSSA plays a role in enhancing the miscibility of polystyrene (PS) and polyethylene oxide (PEO) according to the IR and the DSC studies. The resulting polymer blend is a proton electrolyte. The influence of the mixing extent between PS and PEO on the **proton cond.** has been studied. It is also found that for those samples in which PEO and PS mix well, the hydrophobic PS component can effectively prevent water evapn. from the hydrophilic components at elevated temps., and therefore preserve the **proton cond.** (10⁻⁴ S/cm) at the temp. as high as 80.degree.C.

CC 38-3 (Plastics Fabrication and Uses)

ST polystyrene polyoxyethylene microsphere amphiphilic **membrane**; crosslinked sulfonated polystyrene microsphere amphiphilic blend; **proton conducting membrane** amphiphilic polymer blend

IT **Hydrogen bond**

Membranes, nonbiological

Microspheres

Tensile strength

(**proton-conducting polymer membrane**

based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)

IT Polyoxyalkylenes, uses

(**proton-conducting polymer membrane**

based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)

IT Polymer blends

(**proton-conducting polymer membrane**

based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)

IT Ionic conductivity

(**proton; proton-conducting polymer**

- membrane based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)
- IT 9003-53-6, Polystyrene
(proton-conducting polymer membrane based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)
- IT 25322-68-3, Polyethylene oxide
(proton-conducting polymer membrane based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)
- IT 9003-70-7D, Divinylbenzene-styrene copolymer, sulfonated
(proton-conducting polymer membrane based on sulfonated polystyrene microspheres and an amphiphilic polymer blend)
- L93 ANSWER 8 OF 15 HCA COPYRIGHT 2000 ACS
- 113:232960 Preparation of functional polymeric membranes for proton driven ion transport. Fyles, Thomas
(University of Victoria, Can.). U.S. US 4906376 A 19900306, 9 pp. Cont. of U.S. Ser. No. 929,288, abandoned. (English). CODEN: USXXAM. APPLICATION: US 1989-323195 19890313. PRIORITY: CA 1986-505815 19860403; US 1986-929288 19861112.
- AB A functional membrane, useful for proton-driven ion transport in the recovery of metal ions from solns. contg. other ions, consists of a blend of 2 components, wherein component A comprises an active polymer having cation-binding sites being provided by a crown ether, a cryptand or an acyclic complexone with an ionizable acidic site, with the active polymer being incorporated into a polymer backbone via a spacer component; and component B comprising a support polymer e.g., polyaramides, polysulfones, and polypiperzine fumaramides. Thus, a membrane was manufd. by a phase inversion method from a blend of Nomex (a polyaramide) in AcNMe contg. LiCl and a polymeric crown ether e.g., poly [(2R,3R-N-(N-propenyl)-2-aminoethyl)-2-carboxamido-3-carboxyl-1,4,7,10,13, 16-hexaoxacycloctadecane] soln. The blend was cast on a glass plate, the solvent was evapd., and then the polymer film was immersed in cold H2O to remove the bulk of the solvent. The functional membrane was tested with brine showing that the membrane moved K+ against its gradient while the H+ gradient was still present.
- IC ICM B01D013-00
ICS B01D013-04
- NCL 210500280
- CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 45, 56
- ST membrane proton driven ion transport;
crown ether polymer blend membrane; cryptand polymer bl membrane; complexone acyclic poly membrane;
polyaramide support m mbrane; polysulfone support membran ; polypiperzine support membrane
- IT Membran s
(cation binding polymer-polymer support, for proton

- driven cation **transport**, in metal ion extn.)
- IT Polysulfones, uses and miscellaneous
(supports, for polymeric **membranes**)
- IT Polyamides, uses and miscellaneous
(arom., supports, for polymeric **membranes**)
- IT Crown compounds
(ethers, polymers, prepn. of, for **membranes**)
- IT 9006-26-2 9011-13-6
(in polymeric **membrane** prepn., for **proton**
-driven cation **transport**)
- IT 130449-07-9
(**membranes**, for **proton-driven cation**
transport)
- IT 116614-11-0P 116614-12-1P
(prepn. and use of, in **membranes**)
- IT 24203-36-9P, Potassium ion, preparation
(sepn. of, from brine solns., **membranes** for)
- IT 28470-64-6
(supports, for polymeric **membrane**)
- IT 24938-60-1, Nomex 28727-56-2
(supports, for polymeric **membranes**)
- L93 ANSWER 9 OF 15 HCA COPYRIGHT 2000 ACS
- 112:89470 Manufacturing of **proton conductor** film
having improved conductivity. Yasuda, Ayumi; Yamaga, Noriyuki
(Matsushita Electric Works, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP
01155963 A2 19890619 Heisei, 3 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1987-312624 19871210.
- AB The title method involves dipping a film (which has been prepd. by
casting a soln. contg. a perfluorosulfonate polymer) in an
acid, satg. with H2O, and freeze drying.
- IC ICM B05D001-18
- ICS B01J047-12; B05D007-24; H01B001-12
- CC 76-2 (Electric Phenomena)
- ST **proton conductor** perfluorosulfonate polymer
film; freeze drying **proton conductor** film
- IT Freeze drying
(in manufg. of **proton conductor**
perfluorosulfonate polymer films)
- IT Fluoropolymers
(**proton conductor** films, manuf. of)
- IT Electric **conductors**
(ionic, **proton**, perfluorosulfonate polymer films,
freeze drying in manufg. of)
- IT Cation exchangers
(**membranes**, **proton conductor** films
from Nafion, manuf. of)

=> d 196 1-19 ti

L96 ANSWER 1 OF 19 HCA COPYRIGHT 2000 ACS

- TI Integral fuel cell electrode and matrix and their manufacture
- L96 ANSWER 2 OF 19 HCA COPYRIGHT 2000 ACS
TI Manufacture of gas-diffusion electrodes
- L96 ANSWER 3 OF 19 HCA COPYRIGHT 2000 ACS
TI Gas-permeable electrode
- L96 ANSWER 4 OF 19 HCA COPYRIGHT 2000 ACS
TI Corrosion of graphite composites in phosphoric acid fuel cells
- L96 ANSWER 5 OF 19 HCA COPYRIGHT 2000 ACS
TI Fuel cells
- L96 ANSWER 6 OF 19 HCA COPYRIGHT 2000 ACS
TI Seals for stacked fuel cells
- L96 ANSWER 7 OF 19 HCA COPYRIGHT 2000 ACS
TI Electrolyte matrix for fuel cells
- L96 ANSWER 8 OF 19 HCA COPYRIGHT 2000 ACS
TI Matrix for fuel cell
- L96 ANSWER 9 OF 19 HCA COPYRIGHT 2000 ACS
TI Electrolyte matrix for fuel cells
- L96 ANSWER 10 OF 19 HCA COPYRIGHT 2000 ACS
TI Electrolyte matrix for fuel cells
- L96 ANSWER 11 OF 19 HCA COPYRIGHT 2000 ACS
TI Fuel cell stack
- L96 ANSWER 12 OF 19 HCA COPYRIGHT 2000 ACS
TI Electrolyte vapor condenser
- L96 ANSWER 13 OF 19 HCA COPYRIGHT 2000 ACS
TI Fuel cell matrixes
- L96 ANSWER 14 OF 19 HCA COPYRIGHT 2000 ACS
TI New phosphoric acid fuel cell electrocatalysts made from alumina/pyropolymer composites
- L96 ANSWER 15 OF 19 HCA COPYRIGHT 2000 ACS
TI Fuel cell electrode
- L96 ANSWER 16 OF 19 HCA COPYRIGHT 2000 ACS
TI Gelled sulfuric acid batteries and fuel cells
- L96 ANSWER 17 OF 19 HCA COPYRIGHT 2000 ACS
TI Carbonaceous fuel cell electrode

L96 ANSWER 18 OF 19 HCA COPYRIGHT 2000 ACS
TI Fu 1-c 11 electrodes

L96 ANSWER 19 OF 19 HCA COPYRIGHT 2000 ACS
TI Double-layer oxygen-diffusion electrode for **fuel cells**

=> d 196 1-11,13,15,16,17,18 cbib abs hitstr hitind

L96 ANSWER 1 OF 19 HCA COPYRIGHT 2000 ACS
109:153102 Integral **fuel-cell** electrode and matrix and their manufacture. Kato, Hiroshi; Komada, Ichiro (Japan Gore-Tex, Ltd., Japan). Eur. Pat. Appl. EP 276987 A2 19880803, 9 pp. DESIGNATED STATES: R: AT, BE, CH, DE, ES, FR, GB, GR, IT, LI, LU, NL, SE. (English). CODEN: EPXXDW. APPLICATION: EP 1988-300649 19880127. PRIORITY: JP 1987-17229 19870129.

AB An integrally **molded**, combined **fuel-cell** electrode and matrix comprise a matrix layer contg. 3-20 % PTFE and 80-97 % inorg. (SiC, Ta2O5, ZrO2, or C) powder formed on 1 side of an electrode layer contg. 40-90 % elec. conductive fine C powder supporting a catalyst (Pt) and 10-60 % PTFE. The layers formed by a paste extrusion **molding** process are laminated by rolling and reduced simultaneously to their final thicknesses. An integrally **molded** electrode/matrix body of the invention was prepd. with an overall thickness of 0.25, electrode layer thickness of .apprx.0.15, and matrix layer thickness of .apprx.0.1 mm. When an attempt was made to peel this body at the interface between the 2 layers, peeling occurred within the matrix layer. Bodies of the invention had sufficient strength to withstand handling in **fuel-cell** manuf. and had high foam pressure after impregnated with H3PO4.

ICM H01M004-86

ICS H01M004-88; H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** integral electrode matrix; platinum carbon electrode matrix unit; silicon carbide matrix electrode unit
IT Electrodes

(**fuel-cell**, catalytic, platinum, integrally olded and combined electrolyte matrix and)

IT 7440-06-4, Platinum, uses and miscellaneous (electrodes, catalytic, integrally **molded** and combined with electrolyte matrix, for **fuel cells**)

IT 7440-44-0, Carbon, uses and miscellaneous (electrolyte matrix contg., integrally **molded** and combined catalytic platinum electrode)

IT 409-21-2, Silicon carbide, uses and miscellaneous 1314-23-4, Zirconium oxide, uses and miscellaneous 1314-61-0, Tantalum oxide (Ta2O5)

(electrolyte matrix contg., integrally **mold d** and

combined with catalytic platinum electrode, for fuel cells)

L96 ANSWER 2 OF 19 HCA COPYRIGHT 2000 ACS

108:24635 Manufacture of gas-diffusion electrodes. Motoo, Satoru; Watanabe, Masahiro; Furuya, Choichi (Tanaka Noble Metal Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 62249360 A2 19871030 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1986-92545 19860422.

AB Hydrophilic and hydrophobic carbon powders are mixed with a hydrophobic binder, hot pressed, and cooled rapidly or cooled slowly with pressing to obtain gas-diffusion electrodes. Thus, hydrophilic C powders (av. size 400 .ANG.) 7, hydrophobic C powders (av. size 400 .ANG.) 7, and PTFE powder (av. size 0.2 .mu.) 6 parts were mixed in a dispersing liq., dried, 1.2 g of the dried mixt. powder was pressed in a 100 .times. 100-nm mold at 600 kg/cm² and 360.degree. for 5 s, the pressed sheet was cooled to .apprx.25.degree. in 5 s to obtain a 0.1 .times. 100 .times. 100-mm gas-diffusion electrode. When loaded with Pt at 0.56 mg/cm² and used in H₂SO₄ at 60.degree., this electrode had a polarization of 25 mV (vs. H ref. electrode) for H oxidn. at 3 mA/cm² and polarizations of 800 and 750 mV (vs. H ref. electrode) for O redn. at 0.6 and 2 A/cm², resp. Electrodes of the invention are useful for fuel cells, secondary batteries, electrochem. reactors, and electroplating, and can be used with or without a current collector (hydrophobic carbon sheet).

IT 9002-84-0, PTFE
(mixts. contg., hydrophobic and hydrophilic powd. carbon, gas-diffusion electrodes from)

RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4



IC ICM H01M004-88

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Electrodes

(gas-diffusion from mixts. of hydrophobic and hydrophilic powd. carbon and PTFE)

IT 7440-06-4, Platinum, uses and miscellaneous

(electrodes, catalytic, gas-diffusion, from mixts. of hydrophobic and hydrophilic powd. carbon and PTFE)

IT 9002-84-0, PTFE

- (mixts. contg., hydrophobic and hydrophilic powd. carbon, gas-diffusion electrodes from)
- IT 7440-44-0, Carbon, uses and miscellaneous
(mixts. of hydrophobic and hydrophilic powd., contg. PTFE, gas-diffusion electrodes from)
- L96 ANSWER 3 OF 19 HCA COPYRIGHT 2000 ACS
107:239800 Gas-permeable electrode. Watanabe, Masahiro; Motoo, Satoshi; Furuya, Nagakazu (Tanaka Noble Metal Industrial Co., Ltd., Japan). Eur. Pat. Appl. EP 241432 A2 19871014, 50 pp. DESIGNATED STATES: R: DE, FR, GB, IT, NL. (English). CODEN: EPXXDW. APPLICATION: EP 1987-830085 19870305. PRIORITY: JP 1986-50018 19860307; JP 1986-75238 19860401; JP 1986-76891 19860403.
- AB The electrode for **fuel** or electrolytic cells, comprises a gas permeable layer and a reaction layer which has hydrophobic and hydrophilic portions. Electrolyte penetrates into the reaction layer and does not penetrate into the gas permeable layer, and only the gas produced on or supplied to the electrode penetrates into the gas permeable layer, and the reaction surface is never covered with the gas. Thus a 6:4 PTFE-carbon black gas permeable layer attached with a Cu mesh was attached to a reaction layer of conductive particles loaded with 2 mg Pt and 1 mg Ru/cm², and a hydrophobic binder by press molding, and 2M H₂SO₄ was impregnated into the hydrophilic portion of the reaction layer to obtain an anode. A MeOH **fuel** cell using this anode and a 2M aq. MeOH fuel supplied to the hydrophobic surface of the anode had a c.d. of 200 mA/cm² at 60.degree. and 0.4 V and a limiting c.d. of 1200 mA/cm² vs. 40 and 300 mA/cm² for a cell using an anode without the gas permeable layer.
- IC ICM H01M004-86
ICS C25B011-03
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
- ST methanol **fuel** cell anode; **fuel** cell gas diffusion anode
- IT Anodes
(porous, catalytic, for **fuel** and electrolytic cells)
- L96 ANSWER 4 OF 19 HCA COPYRIGHT 2000 ACS
107:202060 Corrosion of graphite composites in phosphoric acid **fuel** cells. Christner, L. G.; Dhar, H. P.; Farooque, M.; Kush, A. K. (Energy Res. Corp., Danbury, CT, 06810, USA). Corrosion (Houston), 43(9), 571-5 (English) 1987. CODEN: CORRAK. ISSN: 0010-9312.
- AB Thermoset phenolic resins TPR used in H₃PO₄ **fuel** cell components undergo degrdn. which is 50 times higher than that of thermoplastic resins; the corrosion rate of TPR-graphite composites varies with resin types and H₃PO₄ absorption. The corrosion rate of the composites depends on the molding and crack propagation which enhances H₃PO₄

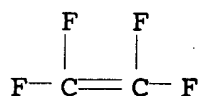
penetration. The corrosion currents for glassy C-graphite-resin composites decrease when the material is heat-treated.

IT 9002-84-0, T flon
 (composite contg. graphite and, phosphoric acid corrosion of,
 fuel cell application in relation to)
 RN 9002-84-0 HCA
 CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

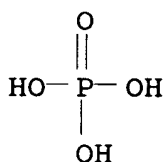
CM 1

CRN 116-14-3

CMF C2 F4

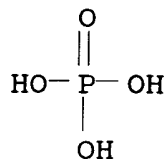


IT 7664-38-2, reactions
 (corrosion by, of phenolic resin-graphite composites,
 fuel cells component application in relation
 to)
 RN 7664-38-2 HCA
 CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)

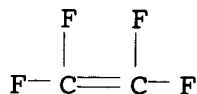


CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38
 ST fuel cell graphite composite corrosion;
 phosphoric acid corrosion graphite composite
 IT Polysulfones, uses and miscellaneous
 (composite contg. graphite and, phosphoric acid corrosion of,
 fuel cell application in relation to)
 IT Fuel cells
 (phosphoric acid, resin-graphite and glassy carbon-graphite
 composites for, corrosion mechanisms of)
 IT 9002-84-0, Teflon 9003-35-4, Varcum 29703
 9016-80-2 25667-42-9, Victrex 25839-81-0, Radel 54847-90-4,
 Udel
 (composite contg. graphite and, phosphoric acid corrosion of,
 fuel cell application in relation to)
 IT 7664-38-2, reactions
 (corrosion by, of phenolic resin-graphite composites,
 fuel cells component application in relation

- to)
- IT 7440-44-0, Carbon, uses and miscellaneous
(glassy, phenolic resin-graphite composites contg., phosphoric acid corrosion of, **fuel cell** applications in relation to)
- L96 ANSWER 5 OF 19 HCA COPYRIGHT 2000 ACS
102:81742 **Fuel cells.** (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP 59171472 A2 19840927 Showa, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-44051 19830318.
- AB A **fuel cell** consists of a pair of gas-diffusion electrodes and a porous electrolyte retainer matrix which is prepd. from SiC and a **H3PO4**-resistant material. Thus, a mixt. consisting of SiC 216 g, WC 54 g, MeOH 300 mL, 95% **H3PO4** 190 mL, and a **Teflon** suspension 62 mL was **cast** between 2 electrodes to form a matrix of 200 .mu. thickness. The **fuel cell** had a stable output.
- IC H01M008-02
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** electrolyte matrix; silicon carbide matrix **fuel cell**; tungsten carbide matrix **fuel cell**
- IT **Fuel cells**
(phosphoric acid, porous electrolyte retainer matrix for, silicon carbide-tungsten carbide)
- IT 12070-12-1
(**fuel-cell** porous electrolyte retainer matrix from silicon carbide and)
- IT 409-21-2, uses and miscellaneous
(**fuel-cell** porous electrolyte retainer matrix from tungsten carbide and)
- L96 ANSWER 6 OF 19 HCA COPYRIGHT 2000 ACS
102:48756 **Seals for stacked fuel cells.** (Sanyo Electric Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59160978 A2 19840911 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-35667 19830303.
- AB A mixt. of SiC powder, 10-50% fluoropolymer, and **H3PO4** is rolled to a sheet and heat treated to prep. sealing material for **fuel cells**. Thus, 5-.mu. SiC contg. 20-30% **PTFE** [9002-84-0] and .gtoreq.85% **H3PO4** .apprx.200 vol.% of SiC + **PTFE** was kneaded, **cast** to a sheet, and heat treated to prep. a sealing material, which was compatible with **fuel-cell** matrix.
- IT 7664-38-2, uses and miscellaneous
(seals contg. **PTFE**-silicon carbide-, for stacked **fuel cells**)
- RN 7664-38-2 HCA
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IT 9002-84-0
 (seals contg. phosphoric acid-silicon carbide-, for stacked
fuel cells)
 RN 9002-84-0 HCA
 CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)
 CM 1
 CRN 116-14-3
 CMF C2 F4



IC H01M008-02
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **fuel cell seal silicon carbide; PTFE**
seal fuel cell; phosphoric acid fuel
cell seal
 IT Seals (mechanical)
 (phosphoric acid-fluoropolymer-silicon carbide, for stacked
fuel cells)
 IT **Fuel cells**
 (seals for stacked, phosphoric acid-fluoropolymer-silicon
 carbide)
 IT 7664-38-2, uses and miscellaneous
 (seals contg. PTFE-silicon carbide-, for stacked
fuel cells)
 IT 409-21-2, uses and miscellaneous
 (seals contg. phosphoric acid-PTFE-, for stacked
fuel cells)
 IT 9002-84-0
 (seals contg. phosphoric acid-silicon carbide-, for stacked
fuel cells)
 L96 ANSWER 7 OF 19 HCA COPYRIGHT 2000 ACS
 101:195213 Electrolyte matrix for **fuel cells**.
 (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP 59075565 A2
 19840428 Showa, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
 1982-185108 19821021.
 AB A matrix is prep'd. from a mixt. of .alpha.- or .beta.-type SiC or

Si₃N₄ which is treated with a hot acid, .gtoreq.95% H₃PO₄, and a fluoropolymer binder. The acid is HCl, H₂SO₄, H₃PO₄, HNO₃, or HF. Thus, .alpha.- or .beta.-type SiC was treated for 1 h at 150.degree. in 95% H₃PO₄, rinsed, and dried. The SiC 100 parts was mixed with 3 parts PTFE and 95% H₃PO₄ to a paste and the paste was cast to a sheet. The matrix had high H⁺ cond.

IC H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST silicon carbide electrolyte matrix; fuel cell electrolyte matrix

IT Fuel cells

(phosphoric-acid, silicon carbide electrolyte matrix for, acid-treated)

IT 409-21-2, uses and miscellaneous
(electrolyte matrix, for phosphoric-acid fuel cells, acid-treated)

L96 ANSWER 8 OF 19 HCA COPYRIGHT 2000 ACS

101:195212 Matrix for fuel cell. (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP 59075564 A2 19840428 Showa, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1982-185105 19821021.

AB The title matrix is prepd. from Si₃N₄, .gtoreq.95% H₃PO₄, and a fluoropolymer. Thus, a 100:3 mixt. of .alpha.-type Si₃N₄ and PTFE formed to a paste with 95% H₃PO₄ was cast to a sheet having a high H-ion cond. and H₃PO₄ retention.

IC H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST fuel cell electrolyte matrix; silicon nitride electrolyte matrix

IT Fuel cells

(phosphoric-acid, silicon nitride electrolyte matrix for)

IT 12033-89-5, uses and miscellaneous
(electrolyte matrix, for phosphoric-acid fuel cells)

L96 ANSWER 9 OF 19 HCA COPYRIGHT 2000 ACS

101:195211 Electrolyte matrix for fuel cells. (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP 59075563 A2 19840428 Showa, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1982-185104 19821021.

AB A matrix is prepd. from a mixt. of .alpha.- or .beta.-type SiC or Si₃N₄, .gtoreq.95% H₃PO₄, and a fluoropolymer binder. The surface of a matrix is coated with a H₃PO₄-compatible film. Thus, .alpha.- or .beta.-type SiC was treated for 1 h in 20% H₃PO₄ and heat treated for 2 h at 300.degree.. The treated SiC 100 parts was mixed with 3 parts PTFE and H₃PO₄ and the mixt. was cast to a sheet. The sheet matrix was mech. strong and had a high H₃PO₄ retention and H⁺ cond. vs. an untreated SiC.

IC H01M008-02

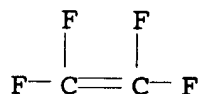
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST silicon carbide electrolyte matrix; **fuel cell**
electrolyte matrix
IT **Fuel cells**
(phosphoric-acid, silicon carbide electrolyte matrix for, heat-
and acid-treated)
IT 409-21-2, uses and miscellaneous
(electrolyte matrix, for phosphoric-acid **fuel**
cells, heat- and acid-treated)
- L96 ANSWER 10 OF 19 HCA COPYRIGHT 2000 ACS
101:154918 Electrolyte matrix for **fuel cells**.
(Mitsubishi Electric Corp., Japan). Jpn. Kokai Tokkyo Koho JP
59056364 A2 19840331 Showa, 4 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1982-166231 19820922.
- AB The title matrix is prepd. with hydrophobic resin fibers coated with
C, SiC, Si₃N₄, or Zr oxide, and an elec. insulating compd. such as
SiC or Si₃N₄. Thus, to a dispersion of PTFE fibers and
0.1-.mu.-size Si₃N₄ 5-.mu.-size .alpha.-SiC was added, and the
dispersion was cast to a sheet, which was heated at
300-350.degree. to prep. a matrix with good electrolytic properties
for H₃PO₄ **fuel cells**.
- IC H01M008-02
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** electrolyte matrix; silicon carbide
electrolyte matrix; nitride silicon electrolyte matrix
IT **Fuel cells**
(phosphoric-acid, silicon carbide-silicon nitride electrolyte
matrix for)
IT 12033-89-5, uses and miscellaneous
(electrolyte matrix from silicon carbide-, **fuel-**
cell phosphoric-acid)
IT 409-21-2, uses and miscellaneous
(electrolyte matrix from silicon nitride-, **fuel-**
cell phosphoric-acid)
- L96 ANSWER 11 OF 19 HCA COPYRIGHT 2000 ACS
99:91089 **Fuel cell** stack. Ueno, Mitsushi; Maoka,
Tadanori; Murata, Kenji; Shirogami, Tamotsu (Toshiba Corp., Japan).
Eur. Pat. Appl. EP 83192 A1 19830706, 20 pp. DESIGNATED STATES: R:
DE, FR, GB, IT. (English). CODEN: EPXXDW. APPLICATION: EP
1982-306806 19821220. PRIORITY: JP 1981-212385 19811225; JP
1982-102810 19820615.
- AB A **fuel-cell** stack has a plurality of stacked
unit cells, each consisting of a pair of gas diffusion electrodes
with a matrix contg. an electrolyte soln. interposed between them,
with an interconnector having a fuel gas passage on surface and an
oxidizing gas agent passage on the other surface interposed between
each pair of adjacent unit cells. One out of every 3-5
interconnectors is a 1-piece-molded product which has
.gtoreq.1 cooling pipe embedded in it and which provides an
excellent cooling effect. The **fuel-cell** stack

stably provides a high output voltage over a long period of operation time. Thus, a **fuel-cell** stack was obtained by stacking unit cells with an interconnector interposed between each pair of adjacent unit cells. **H3PO4** was used as electrolyte, **H** as fuel gas, and air as oxidizing gas. The electromotive reaction was performed at a c.d. of 200 mA/cm². During the reaction, measurements were made of temp. (t1) at outlet port of cooling water, surface temp. (t2) of interconnector having cooling pipes, and max. temp. (t3) of interconnector. Temp. at inlet port of cooling water was 160.degree.. The resp. values of t1, t2, and t3 were 170, 180, and 195.degree. vs. 165, 195, and 215.degree. for a conventional **fuel-cell** stacks. The **fuel-cell** stack according to invention underwent no changes after operating for 1000 h.

IT 9002-84-0
 (cooling pipe coated with film of, in **fuel-cell**
 stacks)
 RN 9002-84-0 HCA
 CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

 CM 1

 CRN 116-14-3
 CMF C2 F4



IC H01M008-02; H01M008-04
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **fuel cell** stack cooling
 IT **Fuel cells**
 (stack, contg. interconnectors with embedded cooling pipes)
 IT Pipes and Tubes
 (cooling, **fuel-cell** stack interconnectors
 with embedded)
 IT 9002-84-0
 (cooling pipe coated with film of, in **fuel-cell**
 stacks)

 L96 ANSWER 13 OF 19 HCA COPYRIGHT 2000 ACS
 95:222940 **Fuel cell** matrixes. (Sanyo Electric Co.,
 Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 56106376 19810824 Showa, 2
 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1980-9513
 19800129.
 AB A mixt. of a matrix material, a sol. material, and a fluorocarbon
 dispersion is **cast**, and the sol. material is leached out
 to prep. a **fuel-cell** matrix, which is
 impregnated with **H3PO4**. Thus, a matrix material of **SiC**

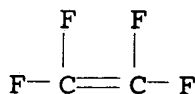
and ZrO₂ was mixed with ZnO (sol. material) and a **PTFE** dispersion, and the resulting mixt. was rolled and leached with HCl to remove ZnO. The matrix was sandwiched between a cathode and an anode of a **H-O fuel cell**.

- IC H01M008-02
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** electrolyte matrix; silicon carbide electrolyte matrix; zirconium oxide electrolyte matrix
IT **Fuel cells**
(electrolyte matrix for, manuf. of silicon carbide-zirconia)
IT 1314-23-4P, preparation
(electrolyte matrix from silicon carbide and, manuf. of **fuel-cell**)
IT 409-21-2P, preparation
(electrolyte matrix from zirconia and, manuf. of **fuel-cell**)
- L96 ANSWER 15 OF 19 HCA COPYRIGHT 2000 ACS
74:70923 **Fuel cell** electrode. Niedrach, Leonard W.; Zeligier, Harold I. (General Electric Co.). Fr. FR 1596541 19700731, 14 pp. (French). CODEN: FRXXAK. PRIORITY: US 19670803.
- AB An aq. emulsion (1 vol.) of 59.6 wt. % **Teflon** was dild. with 7 vols. H₂O, and applied to an Al sheet at 120-150.degree., then heated to 350.degree. to evap. the emulsifying agent and agglomerate the **Teflon** particles. A mixt. of Pt, Na₂WO₃ (x = 0-1), and **Teflon** powders dild. in H₂O was applied to the **Teflon** film; H₂O was then evapd. by heating to 250-350.degree.. The product, useful as an anode in **fuel cells**, was completed by a feed manifold, prepd. from a similar mixt. of Pt, Na₂WO₃, and **Teflon**, applied on an Al sheet and incorporated into the electrode by molding at 350.degree. and 200 kg/-cm.² After incorporation, the external Al sheet was dissolved in a 20% NaOH soln.; the product was then washed and dried. The prepd. anode, contg. 34 mg Pt/cm² and Na₂WO₃ (17 wt. % of the mixt. Pt + Na₂WO₃), showed the best performance when x was 0.9. The **fuel cell** was completed by a cathode of Pt black with **Teflon** binder; O₂ was fed to the cathode and CO to the anode. 5N H₂SO₄ was used as the electrolyte at 25.degree..
- IT 9002-84-0, uses and miscellaneous
(coatings of, on aluminum **fuel-cell** anodes)
RN 9002-84-0 HCA
CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

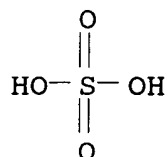
CMF C2 F4



- IC H01M
 CC 77 (Electrochemistry)
 ST **fuel cell** electrode; electrode **fuel cell**; **Teflon fuel cell** electrode
 IT **Fuel cells**
 (anodes, platinum- and sodium tungstate-coated aluminum for carbon monoxide-oxygen)
 IT Anodes
 (**fuel-cell**, platinum- and sodium tungstate-coated aluminum for carbon monoxide-oxygen)
 IT Coating materials
 (platinum and sodium tungstate, on aluminum **fuel-cell** anodes)
 IT Sodium tungsten oxide, bronze
 (coatings of, on aluminum **fuel-cell** anodes)
 IT 7440-06-4, uses and miscellaneous **9002-84-0**, uses and miscellaneous
 (coatings of, on aluminum **fuel-cell** anodes)
- L96 ANSWER 16 OF 19 HCA COPYRIGHT 2000 ACS
 70:83676 Gelled sulfuric acid batteries and **fuel cells**
 . Michaels, Alan S. (Amicon Corp.). U.S. US 3419430 19681231, 3 pp. Continuation-in-part of U.S. 3324068 (English). CODEN: USXXAM. APPLICATION: US 19660926.
- AB **Pb-H₂SO₄** storage batteries in which the **H₂SO₄** is in solid form are described. The electrolyte is identical to conventional aq. electrolytes with regard to the nature of the dissolved electrolyte and the relative proportions of water and electrolyte. It is solidified by including it in a solid gel mass of ionically cross-linked polycationic and polyanionic polymers, formed as described in U.S. 3,271,496. To illustrate, a solid finely divided ionically cross-linked polyanionic-polycationic polymer complex was prepd. by dissolving .apprx.100 parts by wt. of dry powd. poly(Na styrenesulfonate) together with 333 parts by wt. of an aq. soln. contg. 30% by wt. of poly(vinylbenzyltrimethylammonium chloride) in a soln. consisting of 266 parts of 1,4-dioxane, and 33 parts of water, and dilg. the resultant viscous syrup with cold tap water to ppt. a slurry which was then filtered, washed, dried, and ground to pass a 20-mesh sieve. The sole crosslinks present in the solid resin complex were ionic crosslinks. A mixt. was prepd. contg. 150 g. **H₂SO₄** and 30 g. distd. H₂O, then, 30 g. of the finely divided solid crosslinked resin complex described above was stirred in. Then, 90 g. MeOH and .apprx.5 drops of a fluorinated surface-active agent (FC-170) were added. The surface-active agent was used to improve the flow and

leveling properties of the soln.; this mixt. was placed in a tightly sealed jar and left on a roll mill for 24 hrs. A viscous soln. was formed which was subjected to centrifugation for 5 min. One side of an 8 .times. 9 .times. 1/8 in. glass plate was covered with 2 mil **Teflon** film and subsequently with polypropylene nonwoven fabric (1.4 mils). The **Teflon** and polypropylene were held in place with ordinary masking tape along their margins. Care had to be taken to avoid surface wrinkles. A 25-mil drawdown was made by using the supernatant centrifuged soln. on the covered plate with an adjustable, stainless steel drawdown bar. The drawdown was placed in an air circulation over for 1/2 hr. at 55.degree. and subsequently heated in a vacuum oven at a pressure of 28 in. Hg for 2 hrs. at 85.degree., then cooled in a desiccator. A 2nd drawdown was made over the 1st, this time with a clearance of 37.5 mils, and the drying cycle described above was repeated. The drawdown plus drying cycle was repeated twice again at drawdown bar clearances of 50 and 62.5 mils, resp. After the last drawdown, the material was allowed to cool slowly in the vacuum oven over a period of .apprx.6 hrs. with a vacuum of 28 in. Hg being maintained. After cooling, the gel was removed from the plate with a razor blade. The polypropylene nonwoven fabric adhered firmly to the gel and served as a support, while the assemblage was readily released from the **Teflon casting** surface. Two such assemblages, each having a thickness of .apprx.30 mils, were laminated together in a press at room temp. The thickness was held to 52 mils by shims. After pressing, the assemblage was cut to form sqs. of 2 .times. 2 in. Two of these squares of solid gel mass were then equilibrated with **H2SO4** having sp. gr. 1.260 (conventional battery acid). A 3-plate cell (2 neg. plates and 1 pos., each 2 in. sq.) was constructed from conventional pasted and dry charged Pb plates of the type used in conventional Pb-**H2SO4** batteries, and the plates were immersed in conventional battery acid and drained. The 2 sqs. of solid gel mass were then inserted on opposite sides of the pos. electrode or plate in the plate assembly, between the pos. and neg. plates. The entire assembly, which contained no appreciable quantity of free liq. **H2SO4** apart from the electrolyte contained in a solid gel mass and in the Pb plates, was then inserted into a tight fitting cell so that the plates were pressed firmly against the solid gel masses. The cell withstood 18 cycles of charging and discharging without failure. The cell capacity increased from an initially rather low value to .apprx.1 amp. hr. (at a rate of 0.5 amp.) after 5 cycles. Similar results may be obtained by using other org. solvents, such as tetrahydrofuran, during the prepn. of the solid gel mass, or by omitting the org. solvent.

IT 7664-93-9, uses and miscellaneous
(gelation of, for battery electrolytes)
RN 7664-93-9 HCA
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



NCL 136026000

CC 77 (Electrochemistry)

IT **Fuel cells**

(with sulfuric acid gelled electrolytes)

IT **7664-93-9**, uses and miscellaneous

(gelation of, for battery electrolytes)

L96 ANSWER 17 OF 19 HCA COPYRIGHT 2000 ACS

70:53426 Carbonaceous **fuel cell** electrode. Folkins, Hillis O.; Beber, Oral L. (Union Oil Co. of California). U.S. US 3413152 19681126, 3 pp. (English). CODEN: USXXAM. APPLICATION: US 19650730.

AB A 2-layer electrode was prepd. by mixing 1.0 g. of calcined petroleum carbon of .apprx.150 mesh with 0.15 g. com. corn syrup at 75.degree.F. forming the matrix of the electrode by placing the mix in a mold to a depth of 1/16 in., and applying to the matrix a catalytic layer consisting of a mixt. of 0.5 g. of 200 mesh calcined petroleum carbon, 0.5 g. Pt black, 0.15 g. corn syrup, and 0.25 g. of **Teflon** 30 B contg. 0.15 g. of **Teflon** solids. The laminate was pressed at 15,000 psi. at 75.degree.F. and then calcined in a N atm. for 8 hrs. at 600.degree.F. The electrode was tested as a half-cell for the oxidn. of H₂ in M H₂SO₄ at room temp. using a calomel reference electrode. The 2-layer electrode produced a c.d. of 500 ma./cm.² of electrode surface at +0.005 v. vs. S.C.E. and a polarization of only 0.245 v. from the open circuit voltage of -0.24 v.

NCL 136086000

CC 77 (Electrochemistry)

ST **fuel cell** electrodes; electrodes **fuel cell**; carbonaceous electrodes **fuel cells**; **hydrogen fuel cells**

IT **Fuel cells**

(electrodes, two-layer carbonaceous catalytic)

IT Electrodes

(**fuel-cell**, two-layer carbonaceous catalytic)

L96 ANSWER 18 OF 19 HCA COPYRIGHT 2000 ACS

70:16649 **Fuel-cell** electrodes. Landi, Henry P. (American Cyanamid Co.). U.S. US 3407096 19681022, 4 pp. (English). CODEN: USXXAM. APPLICATION: US 19660125.

AB Self-supporting, porous, unsintered, extensively fibrillated electrode structure are prepd. by mixing 60-98 parts poly(methyl methacrylate) I, 2-40 parts poly(tetrafluoroethylene) II, (particle size 0.05-1.0 .mu.) and 2-98 parts filler (50-98% of the electrode

structure), such as graphite, powd. C, Ni, Ta, and carbides of W or Ti, at 170-200.degree. and after cooling, extruding into a sheet. The I is extd. with Me₂CO and substituted by 1-10 mg. catalyst of noble metals or Ni, Ag, and Hg-Ag mixts. per cm.² of surface. Other inert thermoplastic resins can be substituted for 5-95% II. The structure has tensile modulus of elasticity of .apprx.8000 psi., elongation at rupture .gtoreq.25%, porosity 50-75%, mean pore diam. 0.2-1 .mu., and permeability to 6M phosphoric acid at 25.degree. equal to at least 1 atm. (permeability is defined as pressure required to force aq. electrolyte through electrode structure). Thus, 5 parts 60% aq. emulsion of II and 20 parts graphite is blended into 95 parts I at 170-5.degree.. After cooling and grinding into pellets, these are injection-molded to form 1/8 .times. 2 .times. 4 in. plaques. The sheet is compression-molded at 180-200.degree. under a pressure of 1000 psi. The sheet is immersed in Me₂CO for 16 hrs. at 25.degree. and washed twice with Me₂CO for 1-2 hrs. The sheet (9-11 mils thick) is impregnated with 10% soln. of chloroplatinic acid in EtOH, dried and subjected to N₂ at 300.degree., and then to H₂ at 100.degree. for 30 min. The catalyzed electrode contains 1.3 mg. Pt/cm.² When used as the H electrode in a cell contg. 9 mg. Pt/cm.² standard electrode and 5N H₂SO₄ electrolyte at 70.degree. and 0.85 v., the c.d. was 8 ma./cm.² and in a cell utilizing 5N KOH, the c.d. was 70 ma./cm.², as the O electrode vs. the same reference electrode in the same cell at 70.degree. and 0.75 v., in 5N H₂SO₄, the c.d. was 2 and in 5N KOH the c.d. was 200 ma./cm.²

IT 9002-84-0, uses and miscellaneous
(fuel-cell electrode matrix)

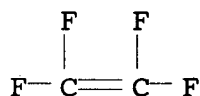
RN 9002-84-0 HCA

CN Ethene, tetrafluoro-, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 116-14-3

CMF C2 F4



NCL 136086000

CC 77 (Electrochemistry)

ST fuel cells electrodes; electrodes fuel cells; platinum fuel cell electrodes; hydrogen electrodes fuel cells; oxygen electrodes fuel cells

IT Fuel cells

(electrodes, self-supporting porous, with polymer matrix)

IT Electrodes

(fuel-c 11, self-supporting, with polymer

matrix)
IT 9011-14-7, uses and miscellaneous
 (fu l-c ll cell electrode matrix)
IT 9002-84-0, uses and miscellaneous
 (fuel-cell electrode matrix)

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(FILE 'HCA' ENTERED AT 11:03:44 ON 31 AUG 2000)

FILE 'REGISTRY' ENTERED AT 11:17:33 ON 31 AUG 2000

FILE 'HCA' ENTERED AT 11:18:40 ON 31 AUG 2000

FILE 'LCA' ENTERED AT 11:53:47 ON 31 AUG 2000

L97 32135 S (PRODUC? OR PROD# OR GENERAT? OR MANUF? OR MFR# OR CREA

FILE 'HCA' ENTERED AT 11:57:09 ON 31 AUG 2000

L98 66554 S L97(3A)MEMBRAN?

L99 3022 S L98 AND L50

L100 120 S L99 AND (L46 OR L47 OR L52)

L101 7 S L100 AND (L73 OR L48 OR L49)

L102 0 S L100 AND L6

L103 11 S L99 AND (L45 OR L47 OR L52)

L104 789 S L99 AND (L46 OR ACID?)

L105 18 S L104 AND (L73 OR L48 OR L49)

L106 3 S L104 AND L6

L107 21 S (L101 OR L103 OR L105 OR L106) NOT (L91 OR L94 OR L92 O

L108 17 S L107 NOT (L93 OR L96)

=> d l108 1-17 ti

L108 ANSWER 1 OF 17 HCA COPYRIGHT 2000 ACS

TI Ion exchanging membranes having high ion conductivity and
manufacture thereof

L108 ANSWER 2 OF 17 HCA COPYRIGHT 2000 ACS

TI Ion-exchange membranes with high ion conductivity and their
manufacture

L108 ANSWER 3 OF 17 HCA COPYRIGHT 2000 ACS

TI Polymer electrolyte membrane fuel cell
electrodes with hydrophilic catalyst layer

L108 ANSWER 4 OF 17 HCA COPYRIGHT 2000 ACS

TI Polychelatogen-coated steel plate with good anticorrosive abrasion
resistance

L108 ANSWER 5 OF 17 HCA COPYRIGHT 2000 ACS

TI Anion effects on vesicle acidification in Dictyostelium

L108 ANSWER 6 OF 17 HCA COPYRIGHT 2000 ACS

TI Microporous membranes of uniform ultrahigh molecular weight
polyethylene and their manufacture

L108 ANSWER 7 OF 17 HCA COPYRIGHT 2000 ACS

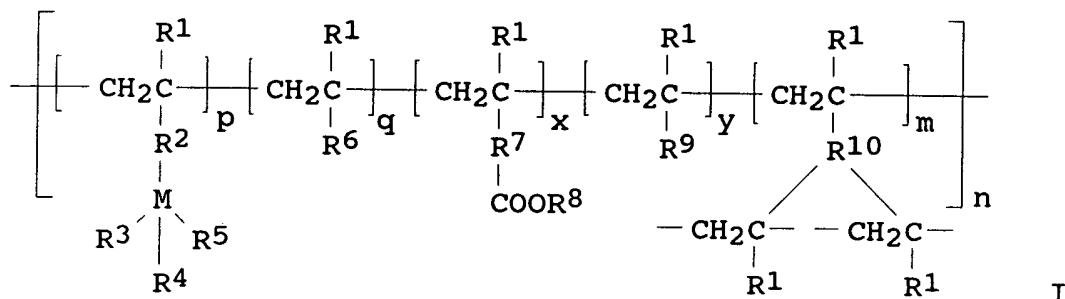
TI A thin porous polyantimonic acid based membrane as a separator in
alkaline water electrolysis

- L108 ANSWER 8 OF 17 HCA COPYRIGHT 2000 ACS
TI **Manufacturing** porous m mbran for gas separation
- L108 ANSWER 9 OF 17 HCA COPYRIGHT 2000 ACS
TI Fluorocarbon cation-exchange membrane and electrolysis process using this membrane
- L108 ANSWER 10 OF 17 HCA COPYRIGHT 2000 ACS
TI Aromatic araliphatic polymers containing phosphoramidate groups
- L108 ANSWER 11 OF 17 HCA COPYRIGHT 2000 ACS
TI In situ formation of cellulose acetate carbamate Dry-RO membranes
- L108 ANSWER 12 OF 17 HCA COPYRIGHT 2000 ACS
TI Membranes for separation of liquid mixtures
- L108 ANSWER 13 OF 17 HCA COPYRIGHT 2000 ACS
TI Phosphorylated cellulose ester membranes
- L108 ANSWER 14 OF 17 HCA COPYRIGHT 2000 ACS
TI Diaphragms for electrochemical cells
- L108 ANSWER 15 OF 17 HCA COPYRIGHT 2000 ACS
TI Substance-transporting membrane
- L108 ANSWER 16 OF 17 HCA COPYRIGHT 2000 ACS
TI Electrolyte membranes based on ethenesulfonic **acid** copolymers
- L108 ANSWER 17 OF 17 HCA COPYRIGHT 2000 ACS
TI Water removal from solutions by using osmotic membranes treated with stabilizing agents

=> d 1108 1-3,6,7,8,12,14,15,16 cbib abs hitstr hitind

- L108 ANSWER 1 OF 17 HCA COPYRIGHT 2000 ACS
133:136439 Ion exchanging membranes having high ion conductivity and manufacture thereof. Arimura, Tomoaki (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000212305 A2 20000802, 13 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-11705 19990120.

GI



AB Title membranes, useful for solid-polymer fuel cells, electrochem. sensors, etc., comprise crosslinked ion exchangers I (R1 = H, aliph. group, arom. group; M = 1- to 4-valent metal; R2, R7 = aliph. group, arom. group, single bond; R3-R5 = aliph. group, arom. group; R6 = arom. group; R8 = H, aliph. group; R9 = **acidic** part-contg. aliph. or arom. group; R10 = aliph. or arom. group having 3 crosslinking groups; p = 1-350; q = 1-500; x = 1-600; yr = 1-300; m = 1-200; n = 10-10000). Thus, a soln. contg. 11.26 g acrylic acid and 2.77 g 2-acrylamido-2-methylpropanesulfonic acid was added dropwise into a soln. contg. dimethylethoxyvinylsilane 2.27, styrene 1.95, and triallyl cyanurate 0.0667 g to give a polymer, which was mixed with DMF to adjust viscosity 100 sP and **cast** on an Al plate to give a membrane showing ion cond. 0.2 S/cm.

IC ICM C08J005-22

ICS G01N027-333; H01M008-02

CC 38-3 (Plastics Fabrication and Uses)

ST ion exchanging membrane manuf;

methoxyvinylsilane styrene acrylic acid copolymer;
acrylamidopropanesulfonic acid triallyl cyanurate
copolymer; solid polymer fuel cell ion
conductor; electrochem sensor ion conductor membrane

IT Fuel cells

(solid polymer; ion exchanging membranes having high ion cond.
and manuf. thereof)

L108 ANSWER 2 OF 17 HCA COPYRIGHT 2000 ACS

132:294823 Ion-exchange membranes with high ion conductivity and their manufacture. Arimura, Tomoaki (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000119420 A2 20000425, 14 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-297266 19981019.

AB The membranes, useful for solid-polymer fuel cells, electrochem. sensors, etc., are made of ion exchangers consisting of arom. group unit $\text{CHR1CR2}(\text{ArR3R4})$ (I), carboxyl group unit $\text{CH2CR5R6}(\text{CO2H})$ (II), orientation group unit CH2CHR7 (III), strongly acidic group unit CH2CHR8 (IV), and crosslinking unit CH2CHR9CH2CH (V) represented by $(\text{IhIIIiIIIjIVkVm})_n$ (h, i, j, k, m, n = d.p. and 1-300, 1-400, 1-50, 1-150, 1-40, and 10-1000, resp.) and are manufd. by polymg. the corresponding monomers in the mol.

ratio of (0.2-10):(0.1-8):(0.01-1.0):(0.1-10):(0.01-1.0). Thus, an aq. soln. contg. 2-acrylamido-2-methylpropanesulfonic acid 10, acrylic acid 6.96, and (NH₄)₂S₂O₈ 0.10 g was added dropwise to DMF contg. styrene 10.06, 2-vinylnaphthalene 0.744, 3,9-divinyl-2,4,8,10-tetraoxaspiro[5.5]undecane 0.923, and AIBN 0.20 g and heated to give a polymer (h, i = 60, j = 10, k = 30, m = 3, n = 10) soln., which was filtered and cast to form a film showing ion cond. 0.224 S/cm.

- IC ICM C08J005-22
ICS C08J005-22; C08F008-00; C08F210-00; C08F212-04; C08F220-04;
C08F228-02; G01N027-333; H01M008-02
- CC 38-3 (Plastics Fabrication and Uses)
- ST vinylnaphthalene acrylamidosulfonic acid polymer ion
exchanger; styrene acrylic acid polymer ion exchanger;
orientation polymer ion exchanger
- IT Cation exchange membranes
(manuf. of ion-exchange membranes with high
ion cond.)
- IT 264907-08-6P, 2-Acrylamido-2-methylpropanesulfonic acid
-acrylic acid-3,9-divinyl-2,4,8,10-
tetraoxaspiro[5.5]undecane-styrene-2-vinylnaphthalene copolymer
264908-72-7P, Allylsulfonic acid-divinylspiro[4.4]nonane-
vinylacetic acid-vinylcyclohexane-vinylpyridine copolymer
264908-75-0P, 2-Acrylamido-2-methylpropanesulfonic acid
-.alpha.-chlorostyrene-divinylspiro[3.5]nonane-vinylbutanoic
acid-N-vinylcarbazole copolymer 264908-78-3P
(manuf. of ion-exchange membranes with high
ion cond.)

L108 ANSWER 3 OF 17 HCA COPYRIGHT 2000 ACS

132:168639 Polymer electrolyte membrane fuel cell
electrodes with hydrophilic catalyst layer. Pugazhendhi, P.; Raja,
M.; Sasikumar, G.; Sridhar, P. (Centre for Electrochemical and
Energy Research, SPIC Science Foundation, Chennai, India). Bull.
Electrochem., 15(9-10), 353-356 (English) 1999. CODEN: BUELE6.
ISSN: 0256-1654. Publisher: Central Electrochemical Research
Institute.

- AB PEMFC electrodes generally contain three layers, backing layer made
of teflonized carbon cloth or carbon paper, diffusion layer
consisting of carbon powder and Teflon, and catalyst layer. The
catalyst layer contains platinum catalyst in the form of Pt-black or
platinum supported on carbon, Teflon and perfluorosulfonic
acid and polymer. Teflon was thought to be essential in the
catalyst layer and many investigations have been carried out on the
effect of Teflon content in the catalyst layer on electrode
performance. The investigations at Los Alamos National Lab. have
demonstrated high performance even by completely eliminating Teflon
in the catalyst layer. This method of prepn. enables the electrode
to retain the max. amt. of water on the active layer and, hence, to
maintain the high ionic cond. This procedure involves
casting the catalyst layer on the membrane from slurry of
Pt/C and Nafion ionomer. The difficulty assocd. with this method of

- prepn. is in providing a robust structure from solubilized ionomer because such recast films are very fragile. This problem was addressed by **casting** the m mbrane in the sodium **form**. In an updated version of the original fabrication process, thin film catalyst layers are reported to have been **cast** from supported platinum catalyst and solubilized ionomer in the TBA+ form. However, in this method of catalyzing the membrane, the difficulty experienced was in removing TBA+ since the hydrophobic TBA+ cation is relatively difficult to ion-exchange.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST polymer electrolyte membrane **fuel cell** electrode catalyst
- IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT **Fuel cell** electrodes
Fuel cells
(polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT Carbon black, uses
(polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT Fluoropolymers, uses
(polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT 7440-44-0, Carbon, uses
(cloth; polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT 7440-06-4, Platinum, uses
(polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- IT 9002-84-0, Teflon
(polymer electrolyte membrane **fuel cell** electrodes with hydrophilic catalyst layer)
- L108 ANSWER 6 OF 17 HCA COPYRIGHT 2000 ACS
- 119:119043 Microporous membranes of uniform ultrahigh molecular weight polyethylene and their manufacture. Yasugata, Koichi (Asahi Chemical Industry Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 05009332 A2 19930119 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1991-165867 19910705.
- AB The membranes have 3-dimensional network structure and following features: porosity 40%, gas permeation 450 s/100 cm³, .gtoreq.4000

kg/cm² elastic modulus along the machine direction, .gtoreq.400% elongation at break in the direction normal to the machine direction, bubble point in EtOH 2-10 kg/cm², ratio of av. pore diam. to max. pore diam. .ltoreq.1.6. Polyethylene (I, av.-viscosity mol. wt. .gtoreq.2,000,000) mixts. with inorg. powders and 2-component plasticizer mixts. (one has SP value 7.5-8.4 and loaded to 10-150% of I; the other has SP values 8.5-9.5) are mixed, heat kneaded, melted, and **molded** into sheets, followed by extn. of the powders and plasticizers from the sheet, drying, and uniaxial extension to give the membranes.

- IT 1343-98-2P, Silicic acid
(ultrahigh-mol.-wt. polyethylene blends contg. plasticizers and powders of, microporous **membranes** from, **manuf** . of)
- RN 1343-98-2 HCA
- CN Silicic acid (8CI, 9CI) (CA INDEX NAME)
- *** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
- IC ICM C08J009-26
ICS B01D071-26; C08J009-26; H01M002-16
- ICI C08L023-04
- CC 38-3 (Plastics Fabrication and Uses)
- ST ultrahigh mol wt polyethylene **membrane manuf**;
inorg powder plasticizer UHMWPE membrane
- IT Plasticizers
(dioctyl phthalate, ultrahigh-mol.-wt. polyethylene blends contg. silicic acid powders and, microporous **membranes** from, **manuf.** of)
- IT 117-81-7P, Dioctyl phthalate
(plasticizers, ultrahigh-mol.-wt. polyethylene blends contg. silicic acid powders and, microporous **membranes** from, **manuf.** of)
- IT 1343-98-2P, Silicic acid
(ultrahigh-mol.-wt. polyethylene blends contg. plasticizers and powders of, microporous **membranes** from, **manuf** . of)
- IT 9002-88-4P, Polyethylene
(ultrahigh-mol.-wt., blends contg. inorg. powders and plasticizers, microporous **membranes** from, **manuf** . of)

L108 ANSWER 7 OF 17 HCA COPYRIGHT 2000 ACS

106:109970 A thin porous polyantimonic acid based membrane as a separator in alkaline water electrolysis. Leysen, R.; Doyen, W.; Proost, R.; Vandenborre, H. (Studiecent. Kernenerg., CEN, Mol, B-2400, Belg.). Membr. Membr. Processes, [Proc. Eur.-Jpn. Congr. Membr. Membr. Processes], Meeting Date 1984, 319-26. Editor(s): Drioli, Enrico; Nakagaki, Masayuki. Plenum: New York, N. Y. (English) 1986. CODEN: 55OAAAY.

AB Polyantimonic acid based membranes were evaluated as separators in H₂O electrolysis. Thin sheets of polyantimonic acid-polysulfone in different wt. ratios were prep'd. using a film **casting**

technique. According to differences in the prepn. method, the mech. as well as the electrochem. properties of these membranes may be varied. Since OH⁻ exclusion is not a requirement in the use of the membrane as a separator in alk. H₂O electrolysis, **membranes** were **prepd.** having an optimum porous structure in order to obtain a very low resistance to ionic migration. For a 100% polymer film it is known that different types of pores and pore size distributions can be obtained by changing the prepn. parameters. Scanning electron micrographs of these films show the existence of a skin, which contains very fine pores, and underneath there are large fingerlike pores. Measurements of the ionic conduction of these films in alk. medium were carried out and the results show a large scattering.

IT 12712-36-6, Polyantimonic acid
(membranes, for separators in electrolysis of alk. water)
RN 12712-36-6 HCA
CN Antimony oxide (Sb₂O₅), hydrate (9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

CC 72-9 (Electrochemistry)
Section cross-reference(s): 52

IT 12712-36-6, Polyantimonic acid
(membranes, for separators in electrolysis of alk. water)

L108 ANSWER 8 OF 17 HCA COPYRIGHT 2000 ACS

102:47820 **Manufacturing porous membrane** for gas separation. (Mitsubishi Heavy Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59179112 A2 19841011 Showa, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-53920 19830331.

AB Mixt. of metatitanic acid sol, alumina sol, and microparticles of silicic acid was **molded**, dried, and calcined to give a porous membrane. The membrane was mech. strong, had a high heat resistance, and was esp. useful for sepn. of gas. Thus, metatitanic acid 1000 (as TiO₂), alumina sol 400 (as Al₂O₃; hydrolyzate of Al isopropylate), and 25 m.mu. silicic acid 200 g were blended, dried, **molded** into a tube (diam. = 4 mm, thickness 1 mm), and calcined. The sepn. of H/N and H/CH₄ mixts. with this membrane was better than with a silicic acid-free membrane.

IT 1343-98-2
(porous membrane contg., for gas sepn.)
RN 1343-98-2 HCA
CN Silicic acid (8CI, 9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

IC B01D013-04; B01D053-22; C04B021-00
CC 47-2 (Apparatus and Plant Equipment)

IT **Membranes**
(heat-resistant, manuf. of)

IT 1343-98-2 12026-28-7
(porous membrane contg., for gas sepn.)

L108 ANSWER 12 OF 17 HCA COPYRIGHT 2000 ACS

92:59994 Membranes for separation of liquid mixtures. Takida, Hiroshi; Mizuno, Nobuo; Oshima, Tetsuya (Nippon Synthetic Chemical Industry Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 54135673 19791022 Showa, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1978-40868 19780406.

AB Ethylene-vinyl acetate copolymer (I) or an .alpha.-olefin (C12)-vinyl acetate copolymer was crosslinked with boric acid (II) and sapond. to **prep. membranes** for sepn. of methanol [67-56-1]-Me acetate [79-20-9] or propylbenzene [103-65-1]-cyclohexanol [108-93-0]. Thus, 30:70 (molar) I and 1% II were dissolved in MeOH to 30%, **cast** on a polyester nonwoven fabric, immersed in 180:20 water-MeOH, sapond. in 60:40 water-MeOH contg. 10% NaOH at 30.degree. for 5 h and 50:50 water-MeOH contg. 10% NaOH at 30.degree. for 5 h to give degree of sapon. 72 mol% for the surface layer and 50 mol% for the inner layers, immersed in MeOH at 35.degree. for 60 min, and treated in 30:70 MeOH-MeOAc at 20.degree. for 24 h to give a membrane. A 30:70 MeOH-MeOAc mixt. was sepd. with the membrane to give MeOH concn. 63%.

IT **11113-50-1**

(crosslinking agents, for ethylene-vinyl acetate copolymer membranes for sepn. of liq. mixts.)

RN 11113-50-1 HCA

CN Boric acid (9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

IC B01D013-04; C08J005-18

CC 37-3 (Plastics Fabrication and Uses)

IT **11113-50-1**

(crosslinking agents, for ethylene-vinyl acetate copolymer membranes for sepn. of liq. mixts.)

L108 ANSWER 14 OF 17 HCA COPYRIGHT 2000 ACS

72:117213 Diaphragms for electrochemical cells. (Siemens A.-G.). Fr. FR 1576202 19690725, 9 pp. (French). CODEN: FRXXAK. PRIORITY: DE 19670818.

AB Porous separators made from synthetic hydrophobic materials are rendered hydrophilic by incorporation of ionic groups through copolymn. of hydrophobic monomers with monomers contg. dissociable groups or by subsequent treatment of a suitable polymer with sulfonation or hydrolysis reagents. **Membranes** are **formed by casting** a viscous soln. on a smooth surface and then, perhaps after evapn. of some of the solvent, immersing in a pptn. medium consisting of water or an electrolyte soln. A film may also be extruded into the pptn. medium. Reinforcing materials can be included in the membrane as well as fibrous or particulate substances which may be leached out later to yield macroscopic pores. Examples are given for working with a 93:7 Me methacrylate-methacrylic acid copolymer to give membranes for use in 6N KOH-contg. **fuel c lls**. A c.d. of 50 mA/cm² at a cell voltage of 820 mV was obtained at room tem p. with a cell contg. two 0.5 mm thick films of this type

serving as subst rates for the electrodes; the anode is Raney Ni and the cathode Raney Ag.

IC H01M; B01K
CC 77 (Electrochemistry)
ST **fuel cells** electrodes; electrodes **fuel cells**; polymers **fuel cells** electrodes; Raney metals **fuel cells** electrodes; nickel **fuel cells** electrodes; silver **fuel cells** electrodes; methacrylate copolymers
IT **Fuel cells**
(membranes for, hydrophilic)
IT 25086-15-1, uses and miscellaneous
(membranes, **fuel-cell**)

L108 ANSWER 15 OF 17 HCA COPYRIGHT 2000 ACS

72:67861 Substance-transporting membrane. Oomen, Joris J. C.; Wolters, Donald R. (N. V. Philips' Gloeilampenfabrieken). Ger. Offen. DE 1927968 19700102, 23 pp. (German). CODEN: GWXXBX. PRIORITY: NL 19680618.

AB The title items, which consist of granules embedded in a plastic film, are prep'd. by scattering the granules on an adhesive layer, removing all granules which do not adhere, embedding the layer in a plastic film, and removing the adhesive layer and enough of the plastic film to expose both sides of the granules. Thus, 60-70.mu. granules of a cation exchange resin (Biorad A9 50 W-16) were scattered on an adhesive isoprene rubber film cast on a glass plate, and granules which did not adhere to the adhesive were removed. A mixt. of 50 g adipic acid-butylene glycol-propanetriol polyester (Desmo phen 1200) in 42 g AcOMe and 62.5 g tolylene diisocyanate-trimethylolpr opane prepolymer (Desmodur L) was poured over this layer, air dried, and heated 16 hr at 110.degree., giving a polyurethane film with a layer of ion exchange resin embedded in 1 side. The sides of the granules opposite the adhesive layer were then exposed by treating the polyurethane film with 5% ethanolic KOH, and the adhe sive layer was removed with xylene. The membrane was dried 1.5 hr at 110.degree., giving a flexible product with the ion exchange resin granules exposed on both sides. The membrane had elec. resistance 20.6 ohm/cm2 in 0.1N KCl, and permsel ectivity 99% of the total ion transport. Similar products were prep'd. from polystyrene-based ion exchange resin (B io-Beads X2) and polyimide films. These membranes have good mech. strength and flexibility, contain a high p roportion of the ion exchange resin, and are easy to prep. They are useful in dialysis and electrodialysis, **fuel cells**, accumulator s, batteries, gas sepn., filtration, and reverse osmosis.

IC B01D
CC 37 (Plastics Fabrication and Uses)
IT Cation exchangers, **preparation**
(m mbranes)

L108 ANSWER 16 OF 17 HCA COPYRIGHT 2000 ACS

- 71:4228 Electrolyte membranes based on ethenesulfonic acid copolymers. Stoy, Artur; Kubin, Miroslav; Raab, Miroslav (Ceskoslov. Akad. Ved, Prague, Czech.). Abh. Saechs. Akad. Wiss. Leipzig, Math. Naturwiss. Kl., 49(5), 257-65 (German) 1968. CODEN: ASAWAO.
- AB Certain types of electrolytic cells energized by the reaction $2H_2 + O_2 = 2H_2O$ have solid electrolytes in the form of cation exchange **membranes** which preferably consist of a hydrophobic skeleton (which is not swelled by the electrolyte soln.) in which 70% of a granular cation exchange agent is embedded. Homogenous membranes with cation exchanging **acidic** groups have better electrochem. properties but are swellable and change their dimensions considerably with concn. of the various ions. Stiffening with a textile material reduces the electrolytic qualities. Intramol. stiffening by copolymn. of an electrochem. inert monomer could be an advantage. Copolymers of ethenesulfonic **acid** (I) with acrylonitrile (II) can be considered as model substances. The large variability in using these copolymers in membranes for **fuel cells** lies in their soly. in volatile org. solvents and in nonvolatile but easily extractable org. solvents. II decreases swelling and makes possible an enduring orientation because of its high cohesive forces. Its resistance to hydrolysis is not inferior to that of the already employed copolymers with N,N'-methylene-bismethacrylamide and ethylene dimethacrylate. Ternary copolymers of ethenesulfonic **acid** with acrylamide-acrylonitrile were dissolved in aq. HCONMe₂ to obtain membranes by **casting** onto a horizontal plate and stretching at various temps. in the swollen or nonswollen state. The stretched membranes were treated with HCHO to fix orientation and to reduce ultimate elongation at break and swelling. **Casting** on glass plates was adopted since **casting** on a Hg surface was not esp. successful. Binary copolymers of acrylonitrile-ethenesulfonic **acid** at mol. ratios 2:1 and 5:1 can be **cast** and the treatment with HCHO can be omitted. Acrylonitrile is copolymd. with Na ethenesulfonate in concd. aq. ZnCl₂ yielding a rubbery elastic membrane which is stretched and washed with H₂O. The copolymers are softer than the polymers of acrylonitrile alone. Copolymn. in ZnCl₂ soln. (d. 1.95-2.05) between 2 glass plates takes place with NH₄ persulfate-K pyrosulfite redox initiator at room temp. Addn. of 0.2-1.0% ethylene dimethacrylate reduces tackiness of the membrane. ZnCl₂ must be removed by repeated washing in ice-water. The S content is 5 wt.% of the copolymer. The improved mech. properties are tabulated.
- CC 37 (Plastics Fabrication and Uses)
- ST ethenesulfonic **acid** copolymers; copolymers ethenesulfonic **acid**; acrylonitrile copolymers; cation exchange membranes; ion exchange membranes; **fuel cell** membranes; electrolytic cell membranes
- IT Membranes
- (cation-exchanging, for **fuel cells**)
- IT **Fuel cells**

- IT (membranes for, cation-exchanging)
Cation exchangers, **preparation**
(**membranes, for fu l cells**)
- IT 25722-86-5, uses and miscellaneous 26966-21-2, uses and
miscellaneous 26966-22-3, uses and miscellaneous
(cation-exchanging membranes from, for **fuel**
cells)